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Shop Lighting

A Substantial but Awkward Load

HERE is another of those annoying problems which perplex the consumer and seem to the electricity supply engineer to be amenable to no reasonable solution.

A short time ago a reader who has a shop sent us an indignant letter regarding an increase in electricity charges to which he had just been subjected. He was being charged on the quite common basis of lamp wattage plus a secondary charge for electricity consumed. He doubled his wattage to secure more adequate illumination and thus also doubled his consumption. The supply authorities thereupon doubled his fixed charge —quite justifiably from both the legal and the technical aspects.

Variable "Fixed" Charge

As our reader was neither a lawyer nor a supply engineer he failed to see why (as he maintained) the supply authority should get him in two ways. In the ordinary way when one doubles one's consumption (of potatoes, beer or tobacco, for instance) one expects to pay twice as much as before, barring discounts for quantity. Electricity consumers are sometimes treated in the same way and sometimes they are not.

The shopkeeper may also be a domestic consumer on another kind of two-part tariff. If his fixed charge is based on the rateable value or size of his house he knows that he can install as much as his service will bear without having to pay any more—apart from the increased consumption, which he can understand. Can he then be blamed for wondering why he should be called upon for more fixed charge when he falls in with the suggestion to "Use More Electricity" and increases the load at his business premises?

In the earlier days of electricity supply, when consumption was mainly for lighting, shopkeepers provided an awkward load; their maximum load invariably came on the peak. It was only just, therefore, that they should pay for adding to the peak—hence the wattage charge. Nowadays when the peak may occur during the daytime, or when the evening demand is not so much above the daytime peak, we question whether there is still the same justification for strict interpretation of the letter of the law of electricity supply, particularly in view of the desire to encourage "after-hours" lighting in shop windows the employment of which is being urged upon shopkeepers in most towns.

It must be remembered that we are looking at this matter purely from the consumers' point of view, which we are repeatedly being assured is the angle from which supply engineers must regard their business. It also seems to be the common-sense point of view when divorced from considerations which belong to the dark past.

We shall undoubtedly be reminded of the danger incurred by purchasers of electricity in bulk of having their own maximum demand charge seriously increased by loads such as shop lighting, and, of course, that is a matter which must constantly be kept in mind. But let the supply authority first make sure that such a danger really exists and that the installed wattage basis of charging is not merely a survival of out-of-date conditions.

In an industrial centre it takes a pretty good lighting demand to balance the factory load plus the dinner-time domestic load. The risk, we suppose, comes in winter when industry and lighting overlap and at a time when lighting is most required. It does not appear to be practical policy to limit the shop-lighting demand while that overlap exists. It probably would not pay either shopkeeper or supply authority.

Enormous Scope

Mr. W. J. Jones in his I.E.E. paper last year showed that the kilowatt basis of charging for shop lighting tended to restrict the desirable trend towards the use of higher-wattage lamps. Increased wattage was found to improve the load factor. Mr. Jones indicated the scope by stating that there were at present 750,000 retail shops in this country. They now consumed 1,750 million kWh per annum; by moderate improvements the figure could be raised to 6,800 million kWh.

In the meantime it should be possible to devise tariffs for commercial lighting which will be more acceptable to the consumer and at the same time cover the undertaking's costs, and which, moreover, will require less frequent inspection to make sure that the conscientious consumer is not to be penalised for keeping to his stipulated wattage.

Neutral Switching

WHILE regulations are elaborated to secure safety by earthing, the practice may actually introduce danger. That happens when a switch is installed in the neutral instead of the outer wire. We have just heard of yet another case in which a shock was received during the polishing of a reflector of an electric fire, although care had been taken to see that the two switches on the fire as well as the circuit switch had been opened. The result is that the person cleaning the fire has lost faith in the efficacy of switches, and also in the safety of electricity. This unfortunate effect was not lessened by the information, given by the wireman who was sent to investigate the complaint, that if the framework of the fire had not been earthed "in accordance with the regulations" no shock would have been felt. It is one of the easiest of all tests to see that a switch controls the live wire and a mistake of this kind is inexcusable.

Potentialities of Smaller Markets

OF Britain's exports of electrical equipment last year considerably more than half went to the four leading Empire markets—Australia, South Africa, British India and New Zealand. Recent events in the shape of the development of "secondary" industries have clearly shown, however, that if British electrical manufacturers are to maintain the present level of their overseas business they will have to explore the possibilities of increasing their trade with other countries. Difficult though international commerce is at the present time, there are still countries where this is feasible. In Europe, Rumania is developing into a fairly large buyer of British electrical goods and apparatus, having taken equipment to the value of £143,000 in the first half of this year compared with £76,000 in the same period of last year and £16,000 in the first half of 1937. Ultimately, manufacturers will have to look still further afield, to the countries where electrical development is yet in an early stage. One of these is Iraq, trade prospects with which are discussed elsewhere in this issue. Here British electrical manufacturers have already obtained a good footing, but competition is becoming "fierce" as the country's requirements grow, and it will be necessary to strive hard to maintain the supremacy which has been won for this country's products.

A Convert

ONE of our readers was recently called with some others for an interview in connection with the post of showroom assistant with a municipal electricity supply authority. To the astonishment of the electrical candidates a lady whose experience had been confined to gas salesmanship was selected for the job. Having in mind the proverbial efficiency of the poacher turned gamekeeper, we do not share their astonishment, although naturally they have our sympathy. Knowing the ways of our competitors, the lady should be in a good position to counter their arguments. Moreover, if her qualifications were so good as to place her above her fellow candidates she may be a distinct loss to our rivals.

Where Electricity Scores

ONE of the best statements of the case for domestic electrification which we have seen for a long time appeared recently in the *Gas Times* from the pen of "An Assistant Inspector." Bemoaning the fact that it was most difficult to convince the electrically-minded housewife of the merits of gas, he put point by point the advantages which electrical appliances were considered to have over gas equipment. The principal ones were their modernity and appearance (engendering pride of possession), cleanliness and ease of cleaning, utility and ease of operation and the small amount of attention necessary. Coupled with these virtues was the undoubted selling value of the two-part tariff. We must fairly state that the author considered it possible to surmount these formidable obstacles to the sale of gas, but implied that the gas industry had a great deal to learn from electricity in meeting the desires of the domestic consumer.

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Fair Trading

AT its last annual meeting the Electrical Fair Trading Council promised to issue its "Policy" in the form of a convenient booklet for the use of salesmen and selling staffs generally. This pocket-size guide to equitable trading principles has now made its appearance and should do much to extend the application of the Council's code by making it widely known to those concerned. The new edition contains all the amendments made to date and has been specially prepared with the object of being a constant work of reference. Further details are given in our Commercial section.

Next Week's Radio Show

THE decision to hold again what is one of the most popular events of the year—"Radiolympia"—will be welcomed by the public. From the point of view of the radio industry also its continuation is eminently to be desired, especially at the present time when fewer people are buying new sets of necessity, but many may be persuaded to replace their old sets if they are shown the refinements of the latest models. Wider interest is given to this year's exhibition, which opens at Olympia on Wednesday next, by the inclusion of an export section. Had the industry "nursed" this side of its activities we believe that it would not have been so badly hit during the past couple of years. Sir Thomas Ainscough, Trade Commissioner in India and Ceylon, has frequently appealed to British manufacturers of radio apparatus to turn their attention to the potentialities of the Indian market, which has been assiduously cultivated by Dutch interests. In the first half of this year at any rate exports of radio sets have shown a gratifying improvement. A novelty at Radiolympia will be a model radio factory illustrating the various manufacturing processes. In view of the success of the dealers' television convention last year the idea is being extended, and besides three dealers' conventions there will be four of a popular technical character the speakers at which will include Dr. E. V. Appleton, Sir Stephen Tallents and Sir Noel Ashbridge.

July Output

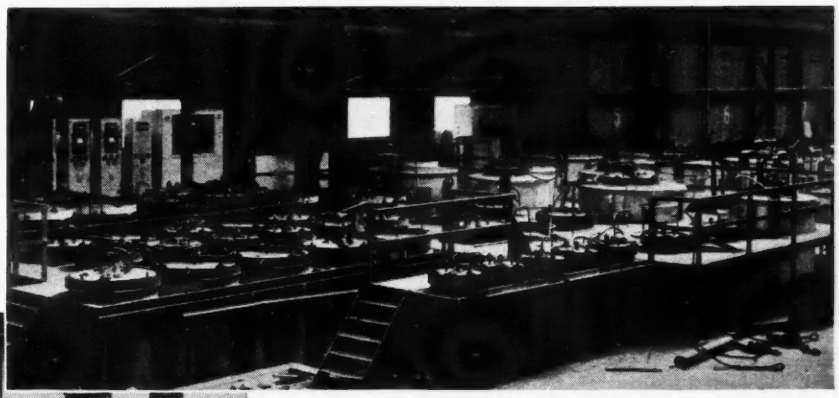
ANOTHER large advance is recorded in the amount of electricity generated. Last month's total of 1,918 million kWh was nearly 16 per cent. more than in July, 1938, and brings the average rate of improvement this year up to 14 per cent. For July, which vies with August in occupying the lowest place in the summer output "valley," the increase is particularly good. Part of the improvement is, of course, attributable to the additional power required for the production of armaments. Not all undertakings dealing principally with industrial supplies have been so favoured, however. In the article on the Newport (Mon) undertaking which follows it is shown how a reduction in the industrial demand is being made up with little or no help from armament work.

DEVELOPMENT AT NEWPORT

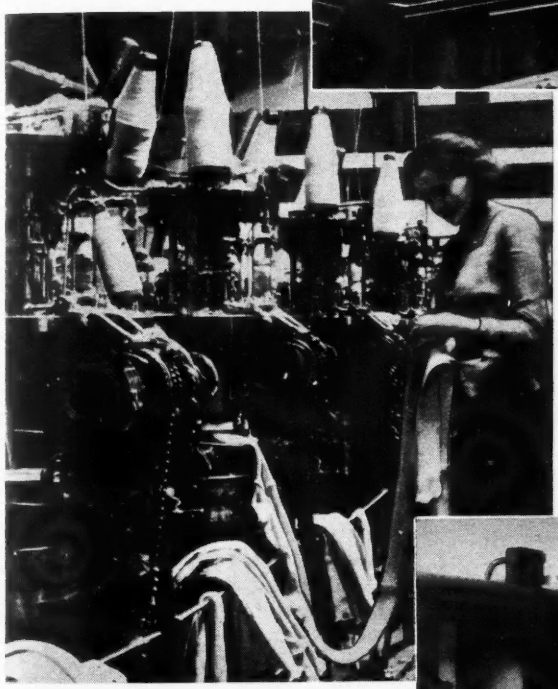
Counteracting a Falling Industrial Load

MOST electricity undertakings which are concerned primarily with industrial supplies appear to be deriving considerable benefit from the increased consumption required for armament work, and it is therefore interesting to study the present position of an undertaking in an industrial area where there is little or no armament work undertaken. An excellent example is to be found in the fifty-two sq. mile area supplied by the Newport (Mon.) Corporation Electricity Department (borough electrical and transport engineer: Mr. A. Nichols Moore).

Here, out of the 25,950 consumers, 110 take industrial supplies and represent over 31,000 kW connected. This load may not appear large compared with the 89,000 kW connected for domestic purposes, but when the load factor is taken into consideration it will be realised that power supplies account for a very considerable proportion of the undertaking's output. In fact for the year ended March 31st, 1938, the annual consumption for power purposes amounted to no less than 48½ million kWh out of a total output of 68 million kWh. Last year, however, there was a somewhat different tale to tell. A definite slump in industry set in, with the result that industrial power consumption declined by no less than 9 million kWh. In recent months conditions have been brighter and a good deal of this leeway has been made up.



By far the largest consumer is the Whitehead Iron & Steel Co., ten of whose bright annealing furnaces are seen above



Two of the smaller industrial users are Santon, Ltd., and the Newport Hosiery Co. Above are some of the sock knitting machines at the latter's factory, while right are seen Santon water heater cases being taken from the oven after stoving

The principal local industries are the production of iron and steel, steel tubes, and shipping repair work. There is also a considerable amount of general engineering, while at the docks a good deal of electricity is required in connection with the exporting of coal.

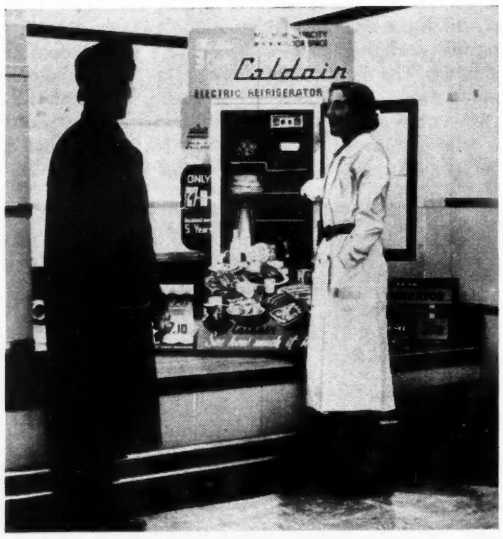
By far the largest consumer is the Whitehead Iron & Steel Co., Ltd. Its consumption in 1937-38 was 22 million kWh, but last year the figure fell to 15 million kWh. Improvement in trade apart, this decrease will be more than made up shortly when six new cold rolling mills requiring a further 1,500 kW are completed. Another addition to this company's plant is also contemplated, namely the installation of six more G.E.C.-Grunewald furnaces for use in bright annealing. Ten of these furnaces are already in use, in addition to one continuous type supplied by Birmingham Electric Furnaces, Ltd., and thermostatically controlled and arranged for heat exchange (saving 15 per cent. of power), provide an almost ideal load which is nearly constant at around 1,000 kW. With the new plant installed the factory will require altogether about 9,000 kW.

John Lysaght's rolling mills, which produce steel sheets, are the next largest consumer, even though some 8,000 kW is generated on site. The load taken from the Corporation is between 2,000 and 3,000 kW and the annual consumption about 9½ million kWh, although it is likely that these figures will be increased as the company's own plant becomes obsolete. About 6 million kWh a year is taken by the Newport and South Wales Tube Co., Ltd., and about 2 million kWh by the flour mills of Smith's (Newport), Ltd., while the rolling mills of Cordes (Dos Works), Ltd., and the Great Western Railway Co.'s docks each use about a million kWh.

Among other comparatively large consumers taking high-voltage supplies are the Newport Cold Storage & Ice Co., Ltd., the Uskside Engineering Co., Ltd., Richard Thomas & Co., Ltd., British Glues & Chemicals, Ltd., the Basic Slag & Phosphate Co., Ltd., Braithwaite & Co., Engineers, Ltd., and West Glou-

cestershire Power Co., Ltd. It speaks well for the Department's industrial load development efforts that, with one single exception, every industrial works within the supply area takes at least a part, usually all, of its power supply requirements from the Corporation.

For a town such as Newport there is, however, a singular dearth of small industries. Santon electric water heaters are, of course, made at Newport, and there are a few somewhat unexpected industries such as glove making (Nore Manufacturing Co.) and stocking and sock knitting (Newport Hosiery Co.), but little else. At present small power consumers pay 2d. per kWh for the first 1,000 kWh per quarter, 1½d. per kWh for the next 10,000 kWh, 1d. per kWh for the next 14,000 kWh, and ¾d. for all over 25,000 kWh, while factory consumers using not less than 1,500 kWh per quarter have their energy for lighting charged at the power rates up to 20 per cent. of the power consumption.



Miss G. V. Eyers, the chief demonstrator, interesting a customer in a refrigerator

The decline in electricity consumption for industrial purposes has incidentally had a serious effect on the finances of the undertaking, revenue last year amounting to only £285,786 as compared with £295,085 in 1937-38, while there was a net surplus of £4,063 as compared with £8,481.

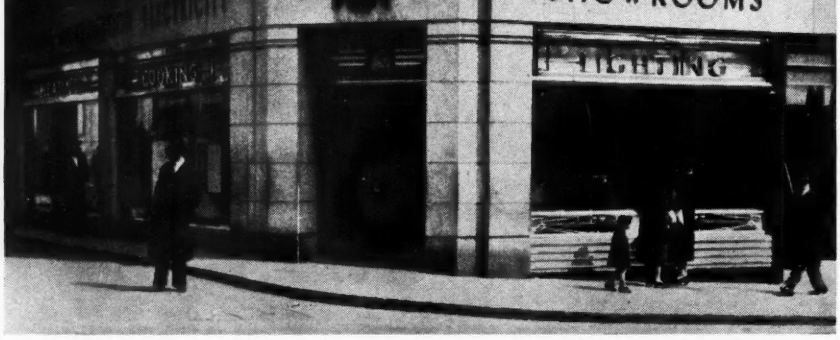
With the industrial load in a somewhat uncertain condition, particular attention has been paid recently to the encouragement of domestic consumption. Of the 2,600 new connections made during the past three years, nearly all are domestic consumers, and there are few homes which have not been induced to install some additional electrical equipment. Actually since 1936 the sales of electricity for domestic purposes have advanced from 7.6 million to 12.4 million kWh, and the consumption per head of the 106,000 population served has increased from 72 to 116 kWh, while the number of consumers per square mile has risen from 1,704 to 1,904 in the borough and from 398 to 445 over the whole area of supply.

As might be expected, the biggest campaign has been in connection with cookers, over 500 of which have been installed in each of the last three years, there being 8,736 in use at March 31st, 1939. Until just lately cookers have been available only on hire (at from 4s. per quarter), with free maintenance, 40 ft. of wiring and a kettle, but now a hire-purchase scheme on a five-year basis, also with free wiring and maintenance, has been introduced, with charges from 8s. 2d. per quarter. Facilities have also been provided for consumers to obtain special flat-bottomed cooking utensils on hire-purchase terms.

Since January, too, electricity for cookers has been available only under the Department's two-part tariff, which provides for collection of accounts quarterly or by prepayment meters. This action has not only eliminated much unprofitable business and rendered only one meter necessary, but has also materially assisted in bringing about what is the aim of most supply engineers, namely, that of inducing consumers to adopt the domestic two-part tariff.

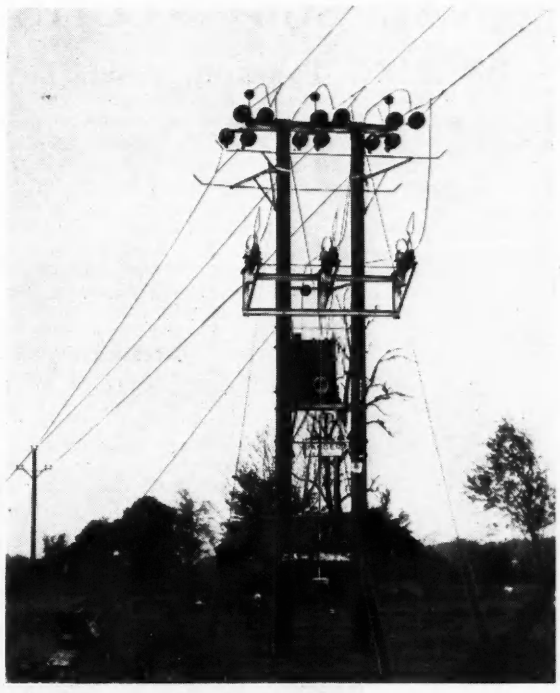
Much persuasion should not, however, be necessary, for this tariff compares favourably with those offered by similarly placed undertakings. Its annual fixed charge is 15 per cent. of the first £40 of rateable value, 12½ per cent. of the next £35, and 10 per cent. of the remainder up to a maximum of £140 (domestic premises of a higher rateable value than £140 are not eligible). The "unit" charge is ½d. in the borough and ¾d. in the country area. The alternative flat-rate charges are: Lighting (quarterly payments), first 1,500 kWh per quarter 5d. per kWh, remainder at 4½d.; lighting (prepayment meter), 5¾d.; heating and power (quarterly), 1d.; heating and power (prepayment meter), 1½d., including hire of cooker and boiler.

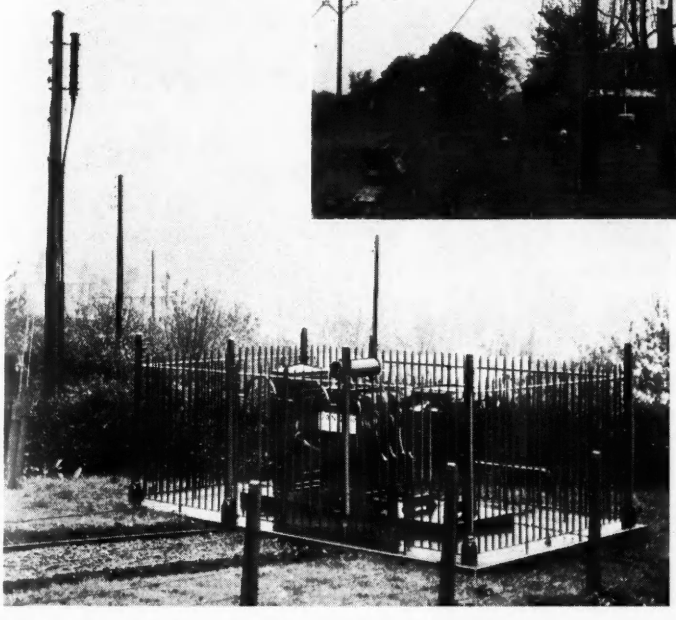
Although progress with cookers may be considered satisfactory, much more striking results are noticeable in connection with other appliances. Three years ago, for instance, there were only sixty-one water heaters connected on hire, all of them of the circulator type, which are much favoured on account of the practice of having boilers behind the living-



The main showrooms in High Street, and (above) the smaller premises at Magor, opened only occasionally

room fires. To-day there are over 1,100, of which nearly a quarter are of the storage type. In addition, there are at least 500 heaters connected which are not being obtained on hire terms, so that altogether there is now a water-heating load of about 4,000 kW. Much of this development must be attributed to a special off-peak water-heating tariff of ¾d. per kWh, offered for thermostatically controlled supplies taken between 6 p.m. and 8 a.m. The Electricity Department encourages home industries by hiring Santon apparatus, various types being available at from 3s. per quarter.





A 25-kVA pole-mounted transformer at Llandavenny stepping down the 11-kV supply, and (below) a 100-kVA outdoor sub-station at Langstone

Since 1936 wash boiler connections, too, have shown a big jump from 1,400 to over 2,400. The boilers are supplied on hire at 2s. 6d. and 3s. per quarter, with free installation and maintenance, and there is a restricted demand for washing machines (obtainable on hire-purchase). Over a hundred refrigerators have also been disposed of on the h.p. system. Hire-purchase agreements are spread over periods ranging from six months to five years. Attractive facilities are provided for assisted wiring, which can, if desired, be paid for through a prepayment meter at 2d. above the normal rate. To date approximately 10,300 consumers have taken advantage of the scheme.

In carrying out this domestic development work Mr. Nichols Moore finds the Department's up-to-date central showroom in High Street of inestimable value. Demonstrations are given there at least twice a week, invitations being sent out to selected consumers. Occasional demonstrations are also given at the Department's small showroom at Magor. These latter premises, which are only opened occasionally, are intended to cater for consumers in the remotest part of the rural area, though it is found that generally rural consumers relish a jaunt into Newport to visit the showrooms there.

Participation in local exhibitions is not found very profitable, although good results have been obtained by two special electrical exhibitions organised by the Electricity Department in recent years. Occasionally demonstrations are given to various guilds and similar organisations, and special attention is devoted to schools. Every domestic science centre is equipped with electric cookers, irons, &c., and demonstrations of washing machines are given at each centre four times a year.

General publicity work is carried out by means of advertisements (one or two a week) in the local Press as well as by posters on various sites, including public vehicles and dust-collection vans, while certain seasonal campaigns are carried out by personal contact. Under the scheme adopted for these special campaigns, sales letters and posted to consumers, and booklets are enclosed linking up with other publicity materials previously sent with the accounts. Canvassers, paid on a salary and commission basis, then visit the consumers. Another type of canvasser, employed on a salary basis only, looks after publicity matters, and follows up normal new business in connection with building schemes, assisted wiring, change-over work, etc.

At the moment particular attention is being paid to the development of the rural area, and already about twenty-four farms have been connected. Several of these are all-electric and use electricity for lighting, heating, cooking and power, for milking sterilising, chaff cutting, corn grinding, etc. A scheme costing £6,000 is well in hand for the extension of mains in the Magor rural district, and soon the residents in the villages of Penhow, Llanmartin, and Llandevaud will be able to have supplies of electricity for all purposes. Other villages already receiving supplies are Duffryn, Bettws, Kemeys Inferior, Bishton, Langstone, and Llandavenny, as well as most of the rural district of Caerleon.

Commercial consumers are not being neglected. They represent a connected load of about 16,000 kW, and are offered a special tariff of 2d. per kWh for all energy consumed above the quantity used for lighting in the previous year. Special rates are also being offered for battery charging, cinemas, and trade refrigeration plant. A new meter test room is being constructed in Llanarth Street to meet the requirements of the Electricity Supply (Meters) Act. With the exception of a few lamps still lighted under contract by gas, all the lamps at Newport are electric.

The Department's development programme is being somewhat hampered by the fact that in 1903 a very extensive DC distribution system was laid down. In spite of very considerable change-over work, nearly one-third of the consumers are still on DC, and to convert all these would cost nearly £250,000. Consequently, the change-over is being undertaken in easy stages as and when convenient and as funds allow.

We should like to thank Mr. Nichols Moore and his staff, particularly Messrs. R. Dimmack (deputy engineer), E. H. Fox (assistant distributing engineer), H. S. N. Sharp (distribution assistant, Eastern District), H. M. Dudley (meter superintendent), T. N. Jones (sales and showroom assistant), and Miss G. V. Eyers (chief demonstrator), for their assistance in the preparation of this article.

I.E.E. Regulations—III

FINAL SUB-CIRCUITS

By H. R. Taunton, A.M.I.E.E.

SECTION 2 of the I.E.E. Regulations is one of the most important, because broadly speaking, it is directed against what is perhaps the commonest fault of those many contractors who lack technical knowledge and experience, and of those others who may have both but lack conscience—overloading of circuits. It is a fault which at the best may mean inconvenience and expense to the user, and at the worst may mean disaster. The rules against it are rightly stringent, and explicit enough to leave no excuse for misunderstanding or evasion.

The weakness they have is one they cannot, *per se*, avoid. A contractor may follow them strictly, and he may load each circuit to the maximum allowed: say, ten lampholders or three 5-A sockets on each. He leaves the job, smug in his rectitude. Presently the inevitable extension is wanted, and then he, or a successor, is confronted with the alternative either of breaking a wiring rule by overloading an existing circuit—and that is generally his choice—or of putting his customer to the disturbance and expense of running a new circuit, with probably a new fuseboard, for perhaps a single distant point.

Consultants and responsible contractors make it their normal practice, wherever there is the least possibility of future extensions, to limit the initial loading of circuits to not more than, say, a half or two-thirds of the maximum allowable, but it wouldn't help matters if the I.E.E. adopted such lower limits. Careful contractors would continue to leave a margin on them, and competitive ones would use them initially to the full and later exceed them.

Suggested Remedy

What, however, might help a little to ensure some provision for future extensions would be a rule stipulating that all dis-boards should have a certain proportion of spare ways, say, 25 per cent. above initial requirements. That also is normal good practice, as is the provision of corresponding blank conduits, run to the nearest convenient duct or floor space. If something of the sort could be defined by rule—not easily, perhaps—it would go some way towards removing from both contractor and user the temptation to connect to already fully loaded circuits new points wanted as time goes on.

What might be made to serve the same end is the new rule, or suggestion, No. 6, amplified in 1108, providing for periodical inspections and tests. Scrupulously obeyed, it would ensure that the circuits of an installation remained within the limits originally laid down. Its efficacy, however, at present depends on the elasticity with which its Form B is interpreted, and, unfortunately, the man who will handle it most lightheartedly is the sort of contractor whose interpretation of Section 2 will be equally elastic.

The old Rule 201, with its ten clauses, is replaced in the eleventh edition by Rules 201 and 202, running, with new matter, to thirteen clauses.

The new note to 201A is rather superfluous. Clause B has now two sensible exemptions. Note in the first the words "where diversity is justified." In the old rules, diversity was not allowable in final sub-circuits. Clause C is now a very short one—but see below—and the note given in the amendments of 1935 has been dropped. Clause D remains almost as before, and that brings us to Rule 202.

Its Clause A covers that part of the old Rule 201C omitted in the present one. Clause B is new and hardly necessary. It only repeats, the other way round, what has been said in Clause A and elsewhere.

Clauses C, D and E replace, and certainly improve, the old Rule 201E. Clause C relates to single-point circuits, D to multiple-point circuits with a diversity factor, and E specifies the current rating of the various points referred to. Observe the altered rating of a 2-A socket, formerly taken as equal to a lamp point (old Rule 201F, later deleted) or 100 W (old Rule 4C), and now to be rated at ½ A. Observe, too, that, for the first time, the rating of a lamp point is given as "at least" 60 W.

Clause F, a little vague, is new. Clause G is the old 201I with the addition of a qualification referring to fuse-plugs; and Clause I is the old 201J with a similar qualification.

The rest of the section is more easily comparable with the tenth edition. Old Rules 202 (light-duty circuits) and 210 (protection of bell circuits, &c.) are omitted, with advantage. They are covered by other general rules, and 202 in particular by rules in Sections 7 and 9. The remaining old rules, 203 to 209, reappear in the new edition with slight amendments and the same numbering. Rule 203 has an addition to its note, excepting from it pilot-lamp circuits in cooker-control units.

As in the old edition, the maximum current of a motor includes, for Rule 204A, its starting or accelerating current whereas in Rule 704A it is taken as the B.S. rating of the motor.

Accessibility of Switches and Sockets

Rules 205 and 206 have been slightly amended, with a gain in clarity. Note in each case the words "in a readily accessible position," referring both to switches and sockets. Switches usually are fixed in sufficiently accessible positions, except where they are part of switch-socket combinations. It is these, and plain sockets, which are so often hidden behind desks and pianos and beds, because nine out of ten of them are fixed on the skirting. There are reasons for this, of course. One is æsthetic; another, even more compelling, is economic. Left to himself, the contractor will naturally fix his sockets near floor level for easy runs without cutting away and making good.

The fact is that, even if the skirting is clear of obstacles, it is not "a readily accessible position" for those of us who have lost the youthful abandon with which we once could touch our toes. Now we are apt to kick skirting switches off and on with the point of our shoes, a practice probably deprecated by switch manufacturers; so, until they give us switch-sockets with long, spatulate, reinforced dollies, kick-proof, contractors who want to comply with the spirit as well as the words of Rules 205 and 206 should compromise by fixing at the usual hand level all switches controlling skirting sockets.

Rule 207 is, as mentioned in a previous article, one of several repetitions of the same point. Its clause A is, word for word, almost identical with Rule 115. The new note attached to it is useful, however.

Switching Amendment

Rule 208, on the switch control of sockets, has an important amendment. Under the old rule two sockets of 5 A or less could be installed (on DC) in a room without local switch control. Now each DC socket of more than 2 A must be so controlled. By Rule 209, unchanged AC sockets need not be switched. The distinction, of course, is a technical one; from the point of view of the user's convenience, all sockets ought to be switch-controlled, whatever the supply to which they are connected.

The principle by which some rules, inter-related, are grouped as clauses under one number, whilst others, as closely connected, are given separate numbers, is not clear. Here, in these two rules, 208 and 209, was surely a case for grouping as clauses, if only to avoid the present space-wasting repetition of exactly the same note after each of them.

The schedule on page 23, at the end of the section, remains the same as before, except that the original column 4, unnecessary, has now been cut out. The words "for general guidance," an amendment of June, 1935, now appear in the note at the head of the schedule. They suggest a latitude which conflicts with the more precise wording of Rule 203.

Lamps for Aircraft

OF the two B.S. specifications for electric incandescent lamps for aircraft recently published No. 3 E.12 is a revision and gives particulars of the dimensions, initial rating and life performance for the following types of lamps: General service (instrument, indicator, cockpit, cabin), navigation (head, tail and side), identification (upward and downward) and signal lamps. The specification gives full particulars with regard to the selection of lamps for testing and the test requirements. Appendices are also included, giving the particulars of the lamp caps and of the gauges for checking their dimensions. Specification E.18 gives similar particulars for aircraft electric incandescent landing lamps fitted with medium and goliath prefocus lamp caps.

Copies of these specifications may be obtained from the British Standards Institution, 28, Victoria Street, S.W.1, price 1s. 2d. each, post free.

THE RADIO EXHIBITION

A General Forecast

By W. E. Miller, B.A. (Cantab), M.I.W.T.

ALTHOUGH a few months ago there was some doubt in certain quarters as to the advisability of holding the usual annual Olympia Radio Exhibition this year, it was finally decided by the manufacturers that the show, which marks in a definite manner the beginning of the radio season, should again be held.

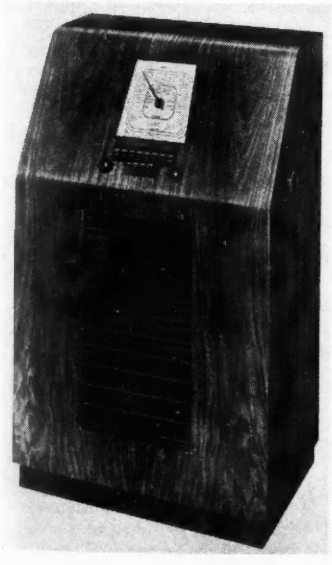
Furthermore, this year the organisers, the Radio Manufacturers' Association, decided early on to do everything possible to make the show as attractive and interesting as possible to all classes of the public, and in this they have been strongly supported by the individual manufacturers who are exhibiting. The result is that the exhibition, which opens at Olympia, London, on Wednesday next, August 23rd, and continues until Saturday, September 2nd, promises to be one of the most successful held in recent years.

The Murphy A72 receiver is interesting in having optional press-button tuning or remote control. The necessary units are fitted at the base of the cabinet. In this illustration the press-button unit is shown in place

The radio industry has had to face up to the fact that, now that there are just over 9,000,000 radio licences in force, the rate of growth of this figure is naturally slowing down rapidly, with the result that sales of receivers to new listeners are small. On the other hand, the replacement market is a large one, and it is to this that attention must be directed if the sales of receivers this season are to be large. Consequently, Radiolympia will set out to convince existing listeners that their receivers, if they are several years old (and many people are using sets which are six or more years out of date) cannot be giving the entertainment value which a modern receiver can provide.

Television Prospects

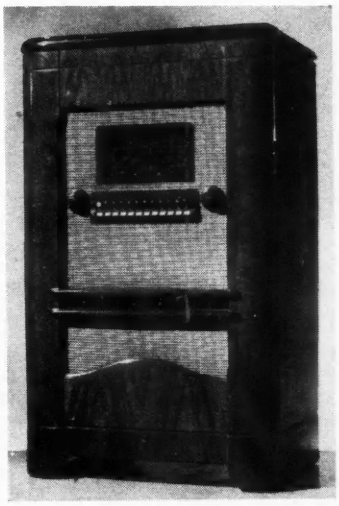
Coupled with ordinary sound reception, there is the newer branch of the industry, television. It is true that as far as the transmissions are concerned, there have been no startling developments since last year; the Alexandra Palace transmitter, serving an area roughly forty miles round London, is still the only one in existence in the country.



Typical of a number of press-button console receivers, this G.E.C. model BC4054 is priced at 14 guineas and has three wavebands

It had been hoped that before now a second transmitter, serving the Birmingham or Manchester areas, would have been operating, but various delays have occurred which have postponed the expansion of the service. It would appear, however, that the inauguration of at least one provincial station cannot long be deferred. In the London area, sales of television receivers have expanded rapidly, and one can say quite definitely that the experimental period is past.

Manufacturers, during the past year or two, have been producing receivers at prices which left little, if any, margin for profit or experimental work; this was done to help popularise the new form of entertainment. This season the prices of television receivers, which had fallen to almost uneconomic levels, are tending to harden, and those who expected to obtain sets at prices below those current last season will be disappointed.

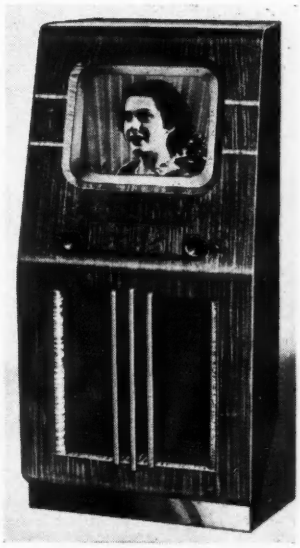


A modern press-button radio-gramophone. This is His Master's Voice model 1500, priced at 24 guineas.

Television will be featured to a large extent at Radiolympia this year, but it will by no means swamp the interest in ordinary sound receivers. The B.B.C. are co-operating with the R.M.A. in convincing the public that modern receivers are capable of a greatly improved performance over the old ones. There will be a cinema in which the B.B.C. will compare the reproduction of a receiver several years old and a modern set.

Model Factory

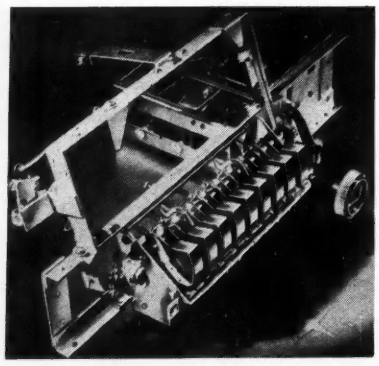
Technical visitors will find more to interest them than there has been for some time. One feature will be a model factory showing various processes of receiver and component manufacture being carried out. Some of the operations to be seen will be coil winding, valve grid making, R.F. coil adjusting, test and assembly, resonance tests, impedance and inductance comparison, engraving, chassis wiring, ganged condenser testing, wire covering and dry battery manufacture. A battery of sixteen revolving drums, showing chassis of many different receivers in stages of construction, will be installed.



A modern television console by Pye, Ltd. This uses a 12-in. cathode-ray tube, and provides vision and television sound. The picture dimensions are 10in. by 8in., and the price is 39 guineas.

Exhibits will be staged by the Royal Navy, the Army, the Royal Air Force, and the G.P.O., showing the way in which radio enters into the activities of these important bodies. Last year a very successful dealers' television convention was held during the course of the exhibition. This year the R.M.A., with the assistance of radio trade and technical journals, radio dealers' associations, and various other bodies, has organised a series of conventions. They will take place in the Convention Hall, and comprise a dealers' television convention, two other dealers' conventions, and four popular technical conventions. Among the speakers will be Dr. E. V. Appleton, Sir Stephen Tallents, Sir Noel Ashbridge, and a number of specialists on various subjects.

Efforts are being made to interest the overseas visitor, and this year the exhibition will have for the first time a special export section. Here will be shown a large selection of British receivers designed for overseas use, some of them being special models not available for the home market. Many of the sets have a tropical finish, specially impregnated coils, special tuning scales with local station names and a form of construction which will pass all local electrical regulations.



This Philips unit is one of the most advanced mechanical automatic tuning systems at the exhibition, and is used on many of their new receivers

For the non-technical visitor there will be numerous entertainment features at the show. The theatre, which was dropped last year, has been reinstated, and this year takes the form of a reproduction of the famous Hollywood Bowl, from which variety programmes will be broadcast and televised. Members of the public will also be televised, and there will be a Television Avenue containing nearly sixty working television receivers. Radio and television receivers will also be working on many of the manufacturers' stands.

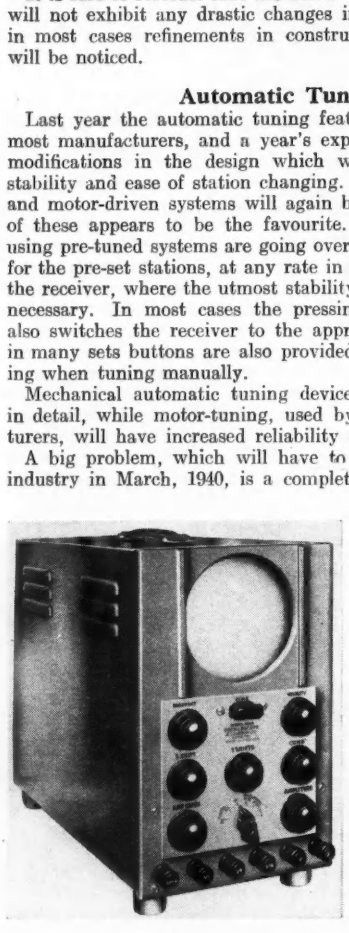
It is safe to forecast that the actual radio receivers on show will not exhibit any drastic changes in technical design, but in most cases refinements in construction and performance will be noticed.

Automatic Tuning

Last year the automatic tuning feature was introduced by most manufacturers, and a year's experience has resulted in modifications in the design which will result in improved stability and ease of station changing. Mechanical, pre-tuned and motor-driven systems will again be seen, and the second of these appears to be the favourite. Most manufacturers using pre-tuned systems are going over to permeability tuning for the pre-set stations, at any rate in the oscillator section of the receiver, where the utmost stability in circuit constants is necessary. In most cases the pressing of a station button also switches the receiver to the appropriate waveband, and in many sets buttons are also provided for waveband switching when tuning manually.

Mechanical automatic tuning devices have been improved in detail, while motor-tuning, used by only a few manufacturers, will have increased reliability and precision.

A big problem, which will have to be faced by the radio industry in March, 1940, is a complete change in the wavelengths of all European transmitters, according to the recently concluded Montreux Convention. The result is that new tuning scales will be needed by every set, and arrangements have been made in new receivers to render scale replacement a fairly simple matter. For the same reason, designers have concentrated on making station changing in automatically tuned receivers as simple and straightforward as possible.



An example of modern service equipment — the Cossor model 3339 double-beam oscilloscope, enabling two traces to be viewed on the screen simultaneously

Quality of reproduction has also received considerable attention from the designers this year. Even some of the low-priced table receivers will be capable of a response better than that of more expensive models of last year; the higher-priced table models by many manufacturers will give results which would not have been considered possible a few years ago. Improved response of the I.F. circuits of superheterodynes, detail improvements in the A.F. circuits in the matter of tone correction, and improved (but not necessarily larger) loudspeakers, coupled with the realisation that the cabinet also plays an important part in the chain of features contributing towards better quality, have all resulted in extended frequency response, and the elimination of unwelcome resonances in the reproduction.

Tone control circuits have also received attention by many manufacturers—no longer are there the two alternatives, shrill or woolly. There also seems to be a tendency towards producing short-wave ranges which are not mere afterthoughts, put in the set to fill the sales requirements, but which are properly designed to give more consistent distant reception.

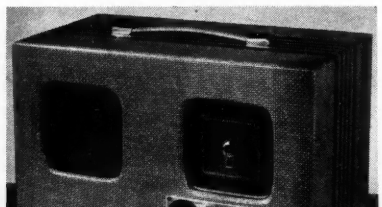
Although there will be no more marked changes in price for models comparable with those of last year, there is no doubt that the new season's receivers will offer better value than before.

There is a tendency towards the production of console receivers at prices very little in advance of the table models of last year, both in performance and reliability. Valves capable of economical running from dry battery L.T. supplies will be seen in some receivers; an electron multiplier type of valve, working on secondary emission principles, is being used in certain television receivers.

Television Receivers

Turning now to the television receivers themselves, the fact that no drastic changes have occurred in their design during the past year is a tribute to the stage of perfection which had been reached even before the television service commenced.

Naturally, the results of the experience of the past two years have been embodied in the new models, and the reproduction now possible from the best receivers is as good as the transmissions permit. This is not to say that the transmissions themselves are poor, but obviously in any system operating on a certain number of lines per picture there is a limit of detail beyond which it is not possible to go. The interlace (between odd and even lines) of the picture has been improved in most receivers.



The Philco P429 is an example of a modern small portable set operating entirely from dry batteries

Electrostatic scanning in receivers has given way almost entirely to the electro-magnetic system, largely on account of the reduced tube length possible; controls have been simplified, and the cathode-ray tubes are capable of a long life without deterioration.

The most popular size seems to be a 9-in. tube, giving a 7½ in. by 6 in. picture; 12-in. tubes (10-in. by 8-in. picture) are also common, while 5-in., 7in. and 15-in. tubes are also used. Console models, with or without provision for ordinary radio reception, seem to be in fashion, although there are some table receivers. There will also be one or two "add-on" units providing vision and the first stages of the sound reception, which is finally reproduced by the A.F. section of an existing sound receiver. Large-screen television will be shown by at least one firm, but for the most part domestic television receivers will be of the ordinary cathode-ray tube type.

Public address equipment, components, special types of aerials, anti-interference devices, valves, batteries, test and service gear, and other products will also be represented at the exhibition.

We hope to publish a detailed survey, compiled as a result of actual inspection of the various exhibits, in our issue of September 1st.

Marine Engineers

THE 1939-40 session of the Institute of Marine Engineers opens on September 28th with the presidential address. The programme also includes the following:—November 14th: "Copper and Copper Alloys—their Properties and Applications in Engineering," by Dr. H. W. Brownsdon. January 9th: "Developments in Welding Practice," by Mr. J. H. N. Thompson. February 13th: "Operating Results of Turbo-electric Propulsion," by Mr. W. J. Belsey.

MAKING DOMESTIC APPLIANCES

Production of Cleaners, Washers and Clocks at a New Leatherhead Factory

IT was in 1901 that Mr. H. Cecil Booth patented the first vacuum cleaner in this country and thirty-seven years have now passed since the British Vacuum Cleaner and Engineering Co., Ltd., of which he is chairman and managing director, started to produce cleaners. The first models were petrol-engine operated, but seven years later a domestic type electric cleaner, the "Model Z," was placed on the market. Since then the company has specialised in the production of the well-known "Goblin" electric cleaners and more recently has developed two additional "Goblin" products, electric washing machines and clocks.

From the commencement of operations until last year the company carried on all its manufacturing in its factory at Parsons Green. Then, however, increasing business made it necessary to move to much larger premises at Leatherhead. Situated on a 20-acre site in rural surroundings the new factory, besides providing the much-needed room for expansion, enables the 750 employees to enjoy conditions conducive to health and contentment. With an eye to the future, the 142,000 sq. ft. of floor area is calculated to cope with double the present output.

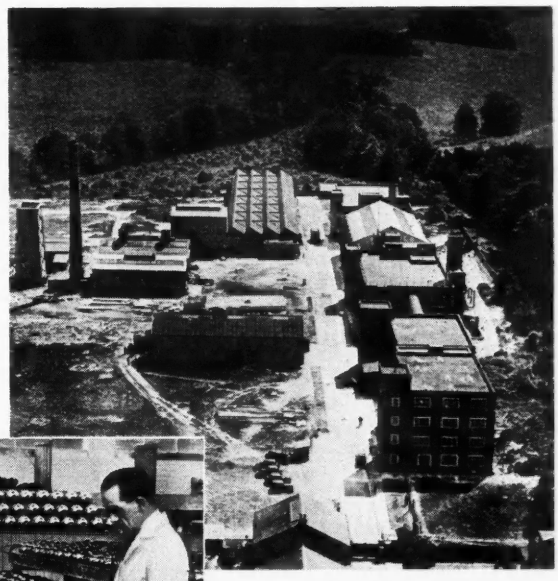
The building is arranged in five main blocks and the first section to which Mr. D. Watkins, director and works manager, took us when we inspected the works recently, was that in which the latest of the company's products, namely clocks, are made. Here, separate departments are laid out for designing, gear cutting, coil winding, tool making, assembling and testing. All the synchronous movements embodied in these clocks are made in the factory.

Several master clocks for the Post Office were under construction, and one interesting unit nearing completion was for the new Town Hall at Greenwich. This includes a four-faced electric turret clock with 13 ft. illuminated hands and dials. This is being supplied through the Magneta Time Co., Ltd., which was recently taken over by the company.

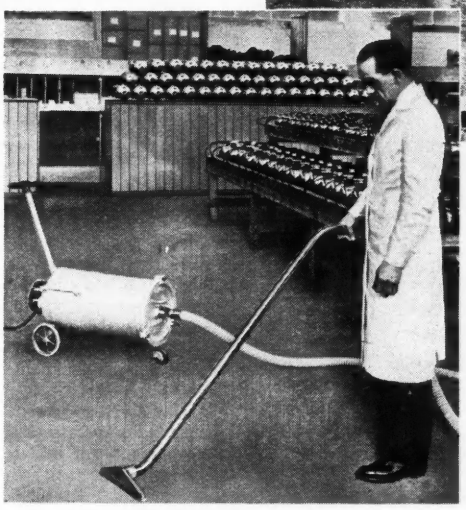
All synchronous clocks now manufactured are being fitted with a new and improved type of movement. Large stocks of all types are carried, including over seventy different "Goblin" models. Incidentally, the company has recently joined the British Synchronous Clock Conference. Special clocks for operating the company's "Teesmade" automatic tea-making outfits, were also seen in various stages of construction.

The assembly of washing machines was the next process we were shown. This is carried out on the first floor of one of the main blocks, the motors coming from the top floor while the remaining components are brought up by lift from the machine shops. Modern degreasing, paint-spraying, and stoving plant is installed in the factory.

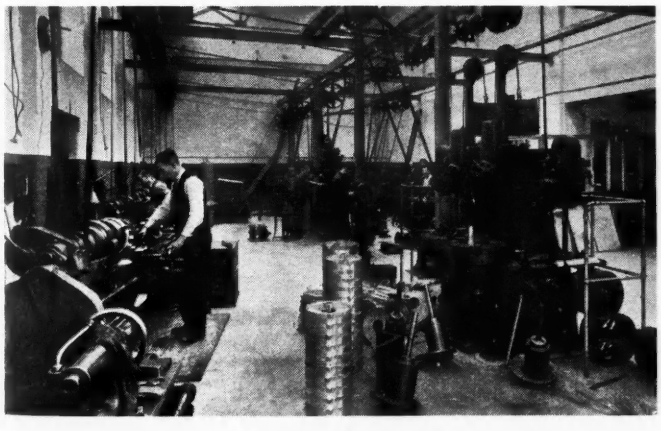
All the necessary machining, drilling, tapping, etc., for both washers and cleaners is done in a well-equipped machine shop on the ground floor. After machining, the various components for cleaners and attachments go to a separate building for rust-proofing, plating, polishing, finishing and assembly. The most up-to-date plant is installed in the polishing room, where special arrangements have been made for dust extraction. A portion of the ground floor of one of the main buildings is just being rearranged to accommodate a new tool room for the larger machine shops other than the clock section, another room being situated nearby for the inspection and testing of appliances.



An aerial view of the British Vacuum Cleaner and Engineering Co's. works at Leatherhead



Trying out a "T.3" industrial type cleaner and (in rear) "Goblin" domestic cleaners undergoing a preliminary test on 50 per cent. overload for two hours



Heavy machine shop

No fewer than twenty-two million parts were used last year in the manufacture of cleaners alone, and with few negligible exceptions were produced in the factory. Although the assembly of such components as flex, filter bags, etc., is carried out in various other departments, a large floor covering 15,000 sq. ft. is used for cleaner assembly. Before final testing, the machines are placed on long racks and run on a 50 per cent. overload for two hours. A five-weeks' stock of cleaners is always in reserve. Industrial type cleaners varying in size up to 40 HP for factories, offices, transport depôts, &c., are made in a separate heavy engineering shop.

Ample storage space is available in the main building for all products, and facilities provided ensure the speedy dispatch of orders. The company makes all its own packing cases and has a special department to deal with publicity and the production of window displays, publicity materials and stationery. It has its own printing works.

Apart from the very pleasant environment, every effort is made to ensure that the employees are happy and contended and a sports ground, canteen, rest and first-aid rooms are among the amenities provided. A ten-minute break from work in the morning and afternoon has been found, by the company, to have a beneficial effect on production.

HIGH-VOLTAGE FUSES

Two New Types

PARTICULARS of a high-voltage high-rupturing capacity fuse, which he has put on the market in conjunction with Electric Transmission, Ltd., Culford Works, Kingsbury Road, N.1, have been sent us by Mr. K. Dannenberg.

Its main features are:—(1) A star-shaped insulating core supporting the conductors of the fuse in intimate contact with a surrounding powder of special material which has a definite

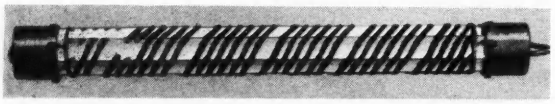


Fig. 1.—Core of a 100-A fuse after clearing a short-circuit

grain so that on the volatilisation of the fuse the metal vapour is immediately absorbed in the powder. (2) A "fusible element" of comparatively small section which is in shunt with a main element and which melts a little later. So long as the fusible element is intact no arc can form along the path previously occupied by the main element; by the time the fusible element melts, the insulation along the main path has been re-established. (3) A helical arrangement of fuse conductor on the outside of the core providing a multiple break which further increases the insulation on operation. The spaces between turns and between the ribs of the support are so arranged that they are not metalised by the vaporised conductors. (4) A high-resistance element of small section by means of which the circuit is finally opened at high speed, the current passing being small in relation to possible initial peak of the fault current.

This type of fuse is at present available for AC operating voltages between 2 kV and 33 kV with current ratings of from 30 to 300 A at the lowest and up to 60 A at the highest. The short-circuit capacity for the 30-A rating (based on the RMS value of the current during the first half cycle when the fuse is replaced by a link) is 350 MVA at 2 kV and 550 MVA at 33

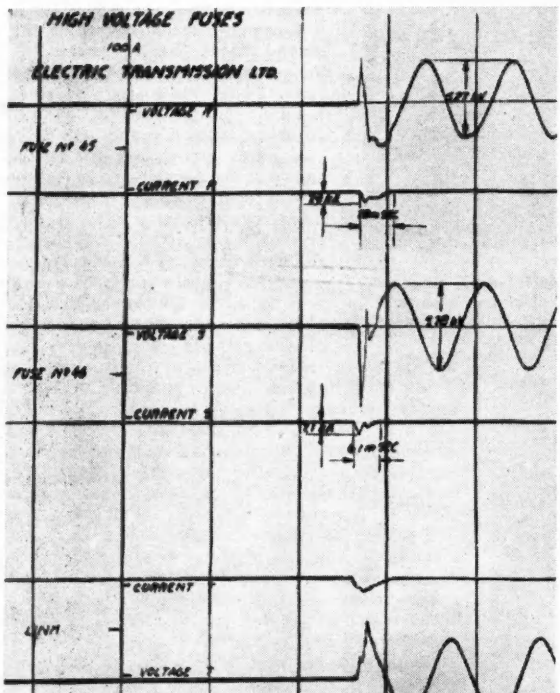


Fig. 2.—Oscillogram record of test on 100-A fuse

kV. For DC circuits the range available is from 300 A or less at 500 V up to 50 A at 22 kV.

Fig. 1 shows the core of a 100-A fuse after clearing in 7.8 millisec. a short-circuit with a prospective peak current of 30,000 A, equivalent to 250 MVA at 10 kV operating voltage. The fault current was actually limited to 8,000 A peak and the insulation resistance after the test reached 40 megohms. The "ropes" round the core are an insulating mixture of powder and condensed metal vapour. An oscillogram record of this test in which a solid link was inserted instead of a fuse in the third phase is given in fig. 2; the maximum current, *i.e.*, that required to melt the fusible element, was reached in about 1.5 millisecs. In fig. 3 is a transient recorded by cathode-ray oscillograph relating to a test on a fuse clearing 35,000 A (peak) *i.e.*, 300 MVA at 10 kV.

Among the main applications of the fuse are the protection of feeder transformers, back-up protection of old switchgear or a second line of defence for new, and of traction apparatus and potential transformers up to 88 kV without a current limiting resistance. Owing to their compactness they are also suitable for underground sub-stations or they can be stored to provide emergency protection.

Independent tests have been carried out at 10, 60 and 100 per cent. of the full symmetrical rating on 3-A and 5-A samples under conditions representing a 500-MVA, 33-kV system. The RMS asymmetrical fault current was 13.3 kA, the asymmetrical fault capacity 760 MVA and the power factor about 0.1. A solid link replaced the third fuse. Each fuse cleared without noise or expulsion of powder within a total operating time of one-fifth of a half-cycle. The maximum current recorded by oscillograph was 400 A in the 10 per cent. test, during which the transient voltage was 25 per cent. above line voltage although it was only 8 per cent. on the 500 MVA test. Rates of rise of recovery voltage in V per microsec. are given as 580 at 10 per cent. rating, 1,420 at 60 per cent. and 2,070 at full rating.

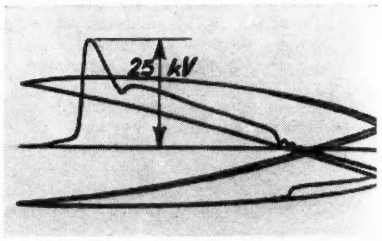


Fig. 3.—Transient recorded by cathode-ray oscillograph relating to a test on a fuse clearing 35,000 A (peak)

Another development introduced by the same concern is a line of high-rupturing-capacity fuses for oil immersion. The "Eetee" fuse has an outer holder of bakelised fabric enabling it to withstand mechanical shocks due to the operation of moving parts of the oil switches on which they are mounted. In addition, a cementless seal is provided between the bakelised tube and the metal fittings at the end of the fuse.

Internally, the bakelised tube is coated with a solution which on becoming solid has a low coefficient of thermal expansion; this is claimed to give—in longitudinal direction—insulation values equivalent to those of the glazed surface of a ceramic holder installed in air. Tests on 2.2-kV, 160-A fuses at a sub-station of an electricity supply company where the fault capacity was 15 MVA showed that the temperature of the outer fuse holder did not rise appreciably above that of the surrounding oil. In tests carried out for another supply company 160- and 100-A "Eetee" fuses at 2 kV successfully cleared prospective faults of 28.4 MVA in the first case and 32.9 MVA in the second.

Large Radio Valves

TWO 100-kW radio valves with filaments that can be replaced have been made by the General Electric Co. of America, for use in the new 100-kW transmitter being completed for that company's short-wave station W2XAF which now operates on 40 kW with six valves, reports *Reuter's Trade Service*. They are stated to be largest valves of their kind built in America and, when used with the new Alexanderson panel antenna, are expected to produce an effective directional power output of more than 600,000 W. It is not expected that they will replace the 100-kW valves in standard, or medium wave, broadcast transmitters.

Instead of being sealed off when built the valves are continuously evacuated by an electrically driven pump attached to them. A filament of activated tungsten is employed so that instead of using upwards of 15,000 V for anodes the new units will operate at 5,000 to 8,000 V. Cooling is accomplished by a circulating water system.

Motor Survey—II

Performance Data

Starting and Acceleration Characteristics and the Elimination of Noise

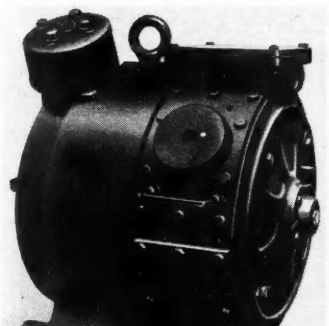
WE shall discuss enclosures in a later article, but because of some confusion which exists as to the drastic effect of various enclosures on rating it is as well to clear the point before dealing with performance. We asked Mr. Stay (Electric Construction Co., Ltd.) to give some approximate comparative figures and his assessment is as follows: open machine (including pipe ventilated and drip proof) 100 per cent., blow-over enclosed 50 to 60 per cent., totally enclosed 25 per cent. These figures refer, of course, to a common frame size. Mr. Stay also said that a one-hour rated totally-enclosed machine corresponds to a six-hour rated open protected machine.

The broadest possible view of efficiency should be taken when considering the performance of a motor, because the effect on the product is the user's main concern; group and individual driving and noise elimination are often principal considerations.

Many users find difficulty in discriminating between torque and HP, and because power is proportional to the product of torque and speed the problem is more pronounced in the case of geared motors. Mr. Davey (Croydon Engineering Co.) referred to the manufacturer's difficulty of ascertaining the torque required, and Mr. Mallet (Normand Electrical Co.) said that the only solution was to rate low-speed machines in terms of torque at the final shaft where the HP may be only a fraction of that of the motor.

In view of the recent improvements in the performance of the squirrel-cage motor many difficulties are arising out of the older but deeply rooted ideas as to the relative performances of the slip-ring and squirrel-cage motors—s.r. for high torque and s.c. for poor torque. To ignore for the moment these later developments a good comparison is made by Metropolitan-Vickers with regard to beater drives in paper mills. The starting conditions are arduous and a s.c. motor will draw approximately six times full load current from the line. An induction motor with a wound rotor will start at the torque specified with between 2½ and 3 times full load current. Some supply authorities limit the starting current of a s.c. motor to a certain number of amperes per phase, and Higgs Motors contend that the starting current of even a s.r. motor is very often in excess of these figures.

Because of the difficulties referred to by the Brush Co. (first article) it is making a feature of controlled torque in its new range of "Contorq" s.c. machines. At one end of the range is the normal s.c. (general purpose) motor with a starting torque of about 33 per cent. (star-delta) and normal acceleration characteristics, while the other extreme is a



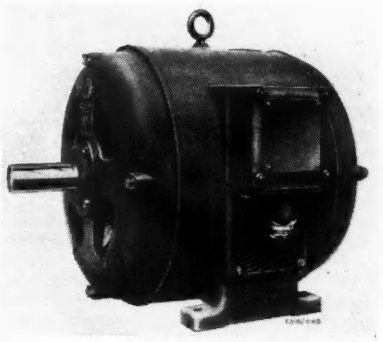
A one-hour rated straight totally-enclosed motor corresponds to a six-hour rated screen-protected motor: An E.C.C. flame and explosion-proof DC motor

motor capable of exerting 75 to 100 per cent. full load torque on star-delta or 200 to 300 per cent. when directly switched to the line. The high starting torque is brought about mainly by specially shaping and spacing the rotor conductors and end rings and by the use of dual windings.

Broadly, improved starting performance of s.c. motors is obtained in two ways—the high resistance rotor and the double cage. Higgs Motors drew a very interesting comparison between these. The high-resistance equipment achieves improved performance at the expense of increased starting current and the double-cage unit at the expense of a larger frame size and reduced power factor. A double-cage motor maintains a high efficiency, but the overload capacity is considerably reduced, as is the power factor, owing to increased reactance. The Higgs "TH" motor is of the high-resistance type, and with a star-delta starter the starting current is limited to about 1¾ times full load current while the starting torque varies between 80 and 100 per cent. full-load torque.

The high-starting-torque "Witton" s.c. motor has two cage windings, one close to the periphery with high-resistance bars and an inner one with low-resistance bars. With auto-transformer starting it will exert full starting torque when taking about twice full load current. In its standard form the Laurence, Scott "Low Current" high-torque motor develops 75 per cent. f.l.t. with 150 to 175 per cent f.l.c. in star-delta. A departure from the double s.c. construction is represented by the "Trislot" motor produced by Horace Green & Co., Ltd. It has a single cage together with a closed circuit winding below and concentric with the single-cage winding. It develops f.l.t. at standstill on star connection, taking about 1.6 times f.l.c. The Bruce Peebles high-torque motor has only one winding, but the inverted T shaped conductors (high resistance top and low resistance bottom) produce a double-winding effect. A useful guiding point made by the Brush Co., calculated to save unnecessary expense and inefficient running, is that when the starting torque required is up to 35 per cent. f.l.t. (about 20 per cent. static and 15 per cent. accelerating) a normal s.c. motor should be used.

One hears little of development of the DC motor towards improved performance, and we believe that this is largely because this motor has set the standard



The Brush Co. is making a feature of controlled torque; a "Contorq" motor

for its AC counterpart to live up to. But most of the developments discussed in this section relate to the range of duties which represents the bulk of motor business, "off the shelf," and for which AC motors are most suitable because of the type of supply generally available. To quote one relevant DC development, however, although it is definitely a "special," there is the G.E.C. steelworks auxiliary motor for tilting tables, screw-down gear, &c. It has shunt fields so rated that they can be left permanently connected to the supply, irrespective of whether the motor is running or not, thus ensuring maximum torque at starting because the fields are always at full strength.

On account of the absence of the rotating field peculiar to three-phase supply, the single-phase motor has presented special starting difficulties. Fortunately, however, three-phase supply is nowadays generally available, except in the domestic field which is catered for almost entirely by the fractional HP motor to which we shall devote a separate article. But in some cases supply and other conditions still leave the problem to be faced and a few examples of its solution follow.

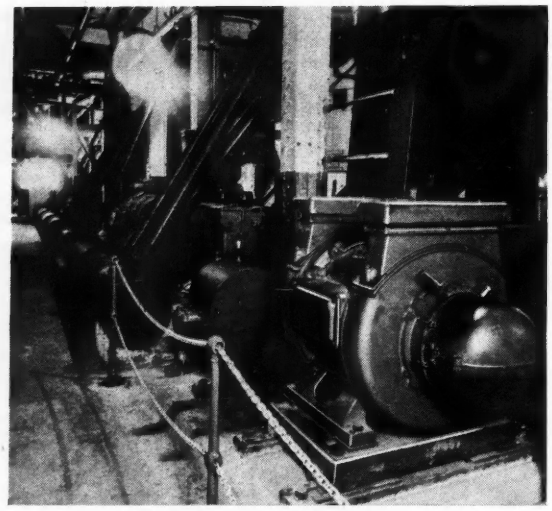
Phase displacement by a condenser is one scheme and the "Lo-Ampstart" single-phase s.c. capacitor English Electric motor up to 20 HP operates with a solid-filled paper-dielectric condenser separate from the machine. A starting torque equivalent to about 45 per cent. f.l.t. is obtainable with about 1.6 times f.l.c. The power factor improving property of the condenser is an interesting point.

The capacitor type "Century" motor, marketed by the Fuller Electrical & Manufacturing Co., Ltd., has a two-phase winding with a condenser for phase-splitting. Mr. Jubb said its starting torque was not so good as that of the repulsion-induction motor (referred to later) but it is popular for small refrigerator service because of the absence of brush gear and its quiet starting up.

Then there is the repulsion-induction motor which starts up by virtue of its "DC armature" winding (repulsion) and runs as an ordinary induction motor. The "Witton" single-

phase repulsion-induction motor of above fractional-HP size will give with direct switching 3 to 3½ times f.l.t. with 2 to 2½ times f.l.c. As soon as the motor reaches a predetermined speed (about 1,200 RPM) the commutator bars are short-circuited by a centrifugally operated device, thus converting the rotor winding into an induction-motor winding.

The Tuscan Engineering Co., Ltd., reports, with reference to its repulsion-induction motors for garage-equipment drives, that it was quickly learned that successful motor operation is bound up with an efficient and robust short-circuiting device. The Tuscan device employs heavy copper segments which rotate on to the face of the commutator and are, therefore, self-cleaning in action. The movement is controlled by a heavy compression spring mounted on the shaft of the motor and completely isolated from the current-carrying parts. This has proved to be a big improvement over the bracelet type of spring. The huge starting torque of 550 per cent. f.l.t. is claimed for the Fuller "Century" repulsion-induction motor.



Starting conditions for beater drives in paper mills are arduous; Metrovick 170-HP s.r. motors belt-driving beaters

Mr. Smith told us of some interesting work done by Fuller Electrical with the Ferraris-Arno system by which three-phase characteristics are obtained on single-phase supply, involving installations up to over 100 HP. One motor on an installation is used for phase splitting the supply to the other motors and when the others are running the pilot can be shut down. The greater the running power the greater the power available for starting up the "three-phase" motors.

Certain applications demand special attention to acceleration and Lancashire Dynamo referred to centrifugal machine drives for the laundry and sugar industries, for example. The main problem is to provide a duty cycle. To take a typical example, the driven basket is accelerated to full speed in 2 to 3 min., maintained at full speed, brought to a standstill in 3 min., and then stopped for discharging and recharging for 1 to 2 min. Such duties are performed by a machine which will stand direct switching current for two minutes. The windings are specially braced and the rotor is designed to give the requisite torque characteristics for accelerating in the specific time. Certain substances require definite times.

The motors are mostly s.c. and are not rated in the normal way because the duties are cyclical, with considerable variations. The bulk of the power is used in acceleration and in the sugar industry powers as large as 100 HP are required. Quick acceleration is also called for by steelworks equipment, such as loaders and live rolls, and the B.T.H. AC mill motor is an example which fulfils this requirement. It has a very low moment of inertia and a starting torque of 2½ times f.l.t.

It was often necessary to get a boiler feed pump into service in 20 seconds said Mr. Greenwood (Harland)—in the event of a failure—and motors are available for this service with direct switching, taking down to 3 to 3½ times f.l.c. The tendency is to adopt direct switching for power station feed pumps mainly because of the required acceleration performance, but also because of the small switchgear cost.

The reasons given by Lancashire Dynamo for direct starting in the case of boiler house fans are: to avoid abnormally long times of running up to speed, as the result of the considerable inertia of the modern fan, and to obtain simplification of control gear and consequent ease of operation. Two-speed motors (usually 750 and 600 RPM) are available for such duties and they have particularly elaborate bracing of the end windings because of the heavy mechanical stresses involved in direct switching. By way of comparison, with reference to the "Witton" high-torque motor already mentioned, it is said that the ordinary s.c. motor with star-delta starting gives a starting torque of about 40 per cent. f.l.t. with about twice f.l.c. or about 120 per cent. f.l.t. with six times f.l.c when switched direct.

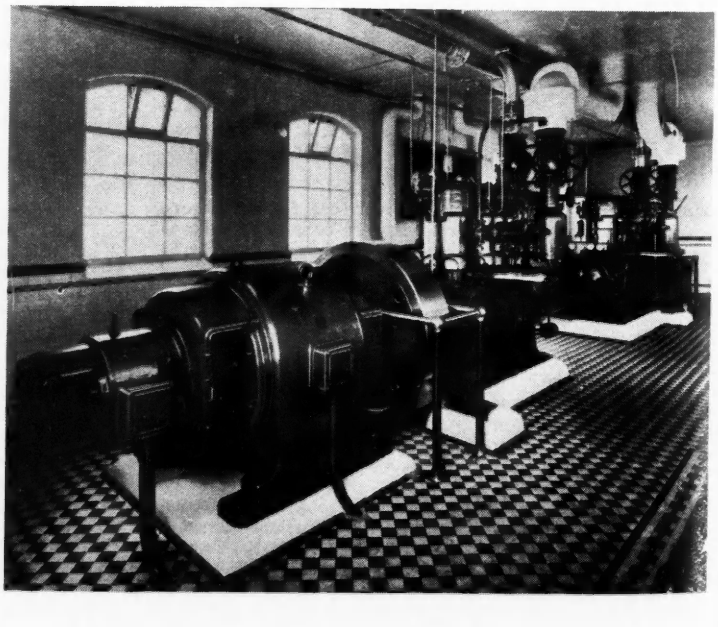
If switched direct the "TH" Higgs motor takes about the same starting current as the high-torque s.c. motor when star-delta started, but the starting torque is of the order of 200 per cent. f.l.t. Measures adopted by the Brush Co. to provide for direct switching of turbine auxiliaries are: braced stator windings, flexible insulation and suitably-shaped rotor conductors to give high reaction at starting and low slip at full speed.

A performance problem which is receiving outstanding attention at the moment is rapid reversals, particularly in connection with machine tools, which we believe has been responsible for the glass-insulation development (see first article). According to the B.T.H. Co. it is a problem of high temperature brought about by motor performance in direct contrast to motor loading, and in such a case the usual high-temperature remedy of increasing the size of the motor only makes matters worse because the temperature is induced by the actual operation of the motor. Considerable advance has been made by this company, using slot windings is insulated with varnished glass and slot wedges of bakelised glass, and the limit at the moment (determined by the varnish) seems to be about 200 deg. C. Much research work is still being conducted in this connection.

Mr. Richards (Higgs Motors) told us about special designs which his company has produced for driving, drilling and tapping machines requiring six reversals per minute by direct switching and with short-circuit conditions when reversing. Asbestos or glass insulation was used. It was quite impossible to comply with the B.S. Specification, he said, because of the vicious circle—more active material more heat. Mr. West (Greenwood & Batey) said that measures to overcome the quick-reversal problem were low speeds, small diameters to reduce inertia (with consequent extra lengths, sometimes double the normal) and very high-grade steel for the shafts.

Power-factor Correction

It is never quite safe to discuss any aspect of power factor without first reviewing the meaning of the term, and quite often the orthodox mathematical explanation seems to make matters worse. We feel we cannot do better here, then, than to quote from Mr. H. P. Carnegie's paper "Systems and Economic Results of P.F. Correction," presented to the Association of Mining Engineers: With induction motors, in addi-

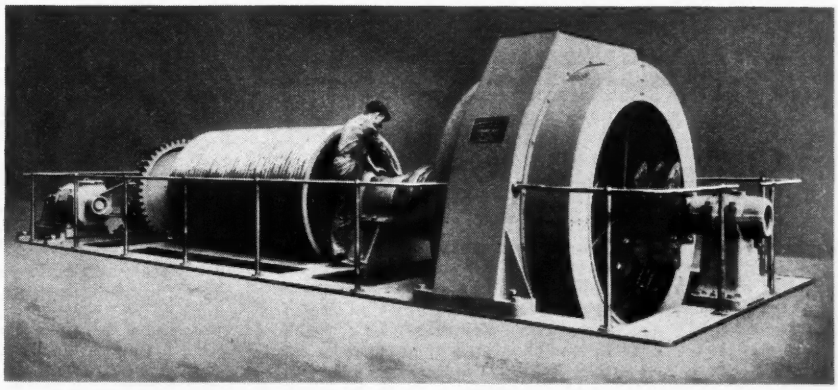


The auto-synchronous motor is an excellent drive for air compressors: Crompton Parkinson 125-HP auto-synchronous motor driving compressors at the Birkenhead Brewery

tion to the useful current which does mechanical work there is another current which pulsates out of time with the voltage. It is analogous to a truck on rails, where there is the useful pull in line with the rails and also a side or idle pull in addition. By mechanics we combine the forward and side pulls to a total pull. This total pull is comparable to the total apparent power (kVA), while the useful pull is comparable to the useful power (kW). The idle pull is comparable to the idle or wattless kVA. (Total kVA)^2=kW^2+(wattless kVA)^2 and kW/kVA=p.f.

The importance of p.f. correction from the application point of view lies in the fact that supply undertakings usually offer favourable tariffs for high p.f. Unfortunately, however, such requirements as starting and overload torque usually render it impossible to use the normally very high p.f. motor and the induction type necessarily has to serve for very many drives.

The phase advancer is often a convenient method of improving the p.f. and this exists as a separate low-frequency generator



The phase advancer is often a convenient method of improving p.f.: 1,300-HP B.T.H. induction motor driving a flour mill and served by a belt-driven phase advancer

or combined with an induction motor as one machine as in the "No-Lag" motor. For large outputs and high-voltage circuits the B.T.H. Co. advocates an induction motor with a separate phase advancer and for small and medium outputs it recommends the combined unit for a drive for which a s.r. motor would otherwise be used, or where the plant is not sufficiently large to justify the expense of installing a synchronous motor. Unity p.f. is obtainable by a commutator and commutator winding.

Synchronous Motors

The synchronous motor is an excellent correcting medium because of its inherent high p.f., but there is often confusion as to the properties of the various types available. These fall under two main headings—salient-pole, a machine like an alternator with its own exciter, and the synchronous induction motor (asynchronous-synchronous motor or auto-synchronous motor) which is virtually an induction motor with excitation on the windings of the rotor. The former has a relatively poor starting torque, but it makes an excellent driving unit for motor-generator sets, and the latter requires a heavy starting current and has a poor overload capacity.

The E.C.C. pointed to the 175 per cent. overload (pull-out torque) of the 4,000 HP 100 RPM unit driving the Morgan mill at Guest, Keen, Baldwin's steelworks, and said that such a performance would be impossible with an auto-synchronous motor. The synchronous induction motor serves excellently for the air compressor without unloading valves for which starting torques up to even 2½ times f.l.t. may be required. The G.E.C. makes a useful comparison: the starting characteristics of a salient-pole motor correspond with those of a standard s.c. motor, while the synchronous induction motor starting characteristics are similar to those of the s.r. motor. Mr. Cass said that his company (Crompton) was supplying auto-synchronous motors mostly for compressors nowadays.

In referring to the suitability of synchronous induction motors for driving air compressors, centrifugal pumps on docks and water-supply systems, line shafting such as in jute and cotton mills, mine ventilating fans and gas disintegrators on blast-furnace gas-cleaning plant, in all cases when correction is required, Mr. Riches (English Electric Co.) appealed for the fullest information concerning the driven-machinery characteristics to be given to the manufacturer because of the heavy rotating masses that have to be pulled into synchronous speed.

Metropolitan-Vickers point to the particular usefulness of the synchronous induction motor for installation extensions. The motor will provide the additional driving power required and also supply the leading kVA necessary to compensate for the low p.f. and the apparatus already installed, even if the load on the new motor must vary between wide limits.

With a view to combining the starting characteristics of the s.r. motor and the running characteristics of the salient-pole synchronous motor the B.T.H. Co. has introduced the salient-pole synchronous motor which has a three-phase winding in the pole faces brought out to separate slip-rings. Because of the two independently designed windings for starting and excitation this motor has an exciter with a more normal voltage and a lower output than that of the usual synchronous induction motor.

Power factor correction is not the only province of the synchronous motor, however, and it can give a specially good account of itself in connection with precision constant-speed work, particularly in the case of very small motors. An application of this sort referred to by the E.C.C. is the maintenance of dialling tones on P.O. telephones. Again, the camera world demanded absolutely constant-speed accuracy from synchronous motors said the Croydon Engineering Co., who pointed to the difficulty of getting adequate information as to the starting and pulley torques required. Take an equipment with a flywheel, for instance: unless the inertia of the flywheel is known it is difficult to design the motor so that it will pull into step and not run just as an ordinary induction motor. The pull-out torque must be known too.

There was a case also, said the E.C.C., in which a synchronous condition depended on *poor* p.f.—an ordinary s.c. rotor with slots in the rotor. It runs as a synchronous machine at loads up to a quarter of normal rating and then as an ordinary induction motor. Assistance in maintaining supply was another application cited by E.C.C. A 15-HP synchronous motor for maintaining the telephone service on a repeater station drives a machine with a very heavy flywheel. In the event of a supply failure there is sufficient energy in the flywheel to drive the motor as a synchronous generator and thus hold in the contactors while the stand-by petrol engine is being started up.

English Electric show how a synchronous motor can readily be converted into a powerful dynamic brake in connection with drives for mixing machinery in the rubber industry for which regulations demand means for the very rapid stopping of the motor to meet cases of emergency involving possible loss of life or limb. This is done by disconnecting the stator from the line and utilising the kinetic energy of the coupled load to drive the machine as an alternator.

Group and Individual Driving

The choice of group or individual drives must exert a very big influence on the choice of motor because, for one thing, the starting characteristics may be changed entirely. In spite of the great advance made by the individual drive the group drive is still advocated in certain cases.

Mather & Platt, Ltd., instance a case for group drive in textile preparatory sections (breaking, opening, scutching, carding, drawing, slabbing and roving), for which considerations of first cost often favour group drives of 100 HP. When conditions permit, however, individual drives afford flexibility of lay-out and working. With reference to paper mills, Metropolitan Vickers say that in older mills where conversion to electric drive is contemplated the existing lay-out often lends itself to group driving and that it must be remembered that this alternative does retain advantages when the load is reasonably constant and is a high percentage of the rated load. Such advantages are higher efficiency and power factor and a permissibly smaller motor with regard to overall capacity. In talking of machine tools, the B.T.H. Co. says that though theoretical considerations might appear to support the view that group drives are sometimes cheaper, detailed comparisons are difficult. The total cost of the electric drive and consumption is estimated at from 2 to 4 per cent. of the total production cost and it is clear that economy in power could not offset even a 5 per cent. increase resulting from reorganisation with individual drives. Group driving can only represent higher efficiency and load factor if the larger machine is fully loaded, while a correctly designed motor can usually be operated at its most efficient point on individual drive. The G.E.C. makes a clear case for individual drive for certain rollers of live roller tables

(Continued at foot of next page.)

CORRESPONDENCE

Every letter must be accompanied by the writer's name and address preferably, but not necessarily, for publication. The Editors cannot accept responsibility for correspondents' opinions

Association for Meter Staffs?

IT would be interesting to obtain the opinions of meter engineers, and others engaged in meter departments, on the formation of a meter staff association, on similar lines to the old M.E.T.A.

I feel sure that all those employed in meter departments throughout the country would consider joining such an association, if it is started. It should be open to all, seniors and juniors, meter manufacturer's staffs and the new meter inspectors.

I would suggest that if sufficient interest is shown in the idea, a few of the senior engineers should hold a preliminary meeting, say at Birmingham, and get a scheme out which can be a basis to start from. METER ENGINEER.

August 9th.

Neutrals and Leakage Trips

Since 1934 you have published many letters of mine on the subject of earth-leakage protection and the need to limit potentials to safe values between consumers' apparatus and earth. The new I.E.E. Regulations are a decided gain in the direction of safety; but the 40-V maximum tripping potential on "domestic, farm and factory premises" mentioned in the B.S. Specification No. 842 appears to assume only human safety is involved. Actually, the safety of cattle is an important factor if the valuable farm load is to be developed, and there are a number of factors still to be considered before the new Regulations attain safety:—

In slaughterhouses pigs are stunned by 25 V AC applied to their heads by the butcher, and they would be stunned if their heads came into contact with metalwork on a farm at that potential despite the "protection" afforded by the leakage trip which conforms with the Regulations. A modern dairy farm which makes full use of electricity also employs other modern appliances. In order that milch cows shall give the maximum yield it is essential that adequate drinking water is always available and many modern farmers find it pays to install metal drinking bowls in each stall which automatically fill as the cows drink. If this metalwork becomes "alive" at 30-40 V it will be impossible for cows to drink, especially when standing on ground made highly conductive by moisture. Even 10 V AC may prevent cows from drinking from a metal water bowl and make the whole watering installation useless.

It is possible to effect tripping at low voltage by connecting, in one form or other, the leakage trip coil between the consumer's metalwork and the neutral when any leakage from phase to metalwork would have a definite and constantly reliable path to the neutral. Tripping can then be effected at low voltage no matter how the earth resistance may vary in wet or dry seasons. It is an electrical engineer's responsibility to have exact information about the whole circuit upon which the functioning of his apparatus depends. This is possible when dealing with metallic conductors, but the new I.E.E. Regulations require leakage trips to function at a maximum of 40 V when their circuit depends on earth resistance and all the factors which cause that resistance value to vary within very wide limits. It is hardly an electrical engineer's province to make special studies on each farm site of the chemistry of soil, rainfall, drainage of land, depth of soil—which cannot be judged from its surface appearance—or if his electrode is driven into soil or a hole which years ago the builders filled in with rubbish before levelling the surface; yet without this information, which directly governs the performance of the leakage trip gear, how is the engineer to comply with the conditions the new Regulations place upon him?

It has been stated that if a trip coil is connected between a neutral earthed at the transformer, and an electrode at a site remote from the transformer, such a connection would constitute multiple earthing of the neutral. There appears to be no definition as to what constitutes a "neutral earth connection" in the practical sense. For example, the neutral-earth connection at the transformer is a safety measure intended to complete a circuit at minimum voltage for a leakage current from phase and effect isolation of the latter. Such an earth connection is only effective provided its resistance does not exceed some value, which may be one or one hundred ohms or some value yet to be defined, and if the resistance is any higher than that defined value then the connection would not constitute an earth.

A ruling on this point would be of great value because suitable protective gear could then be designed which would provide safety on the consumer's site by connecting to earth or the neutral according to the ascertained earth resistance conditions. Instead of having to apply for the Electricity Com-

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Motor Survey (*Concluded from previous page*)

in steel works. It puts the advantages as follows: simplified design of the tables as dead alignment is unnecessary; each self-contained roller can be quickly replaced; reduced maintenance costs in the absence of gearing, &c., and individual rollers can be cut out without interrupting the table operation. Laurence, Scott say that some machine-tool applications fall under the "industrial" (general purpose) classification, but in general the duty is somewhat severe and where a higher degree of protection is required frame cooled totally enclosed motors are more suitable.

Noise Elimination

The development of the modern steel-frame building in which noise is very readily transmitted throughout the whole structure, coupled with the growing demand for electric drives for heating and ventilating and air-conditioning systems, is mainly responsible for the very considerable attention given nowadays to designing motors to run as quietly as possible. What are the requirements for quiet running? The return to the once-forsaken sleeve bearing seems at first very curious, but Mr. Steward (Bull Motors) says that the ball bearing is quite hopeless; the balls knock against one another. English Electric say, with reference to their "Silent" and "Super Silent" motors, journal bearings are fitted where a high degree of silence is essential, but where this is not imperative, or where it is possible to isolate the noise, the machines can be provided with specially selected ball or roller bearings. To avoid slot noise in these motors particular attention is given to obtaining the correct ratio in the numbers of stator and rotor slots and really tight cores are deemed to be vitally necessary for eliminating magnetic hum. Bull Motors say that the correct slot design and numbers for various sizes and speeds have been found experimentally and by calculation, and in the Bull shops we were able to see an interesting contrast. The laminations of the "Super Silent" motor are built up on a heavy spider, whereas those of the ordinary industrial motor are built up on the shaft direct.

Speaking generally, Mr. Smith (Fuller Electrical) said that their main efforts towards noise elimination in their "super silent" motors were towards lower flux densities and the more liberal use of materials.

Bull Motors traced their efforts to reduce noise back to 1898 when the first quiet-running demands were made in connection with organ blowing. The original requirement dealt entirely with DC and the means of obtaining silence were mainly the use of a larger motor than was otherwise necessary, shaping the pole tips, and fairly soft brushes. There is probably no such thing as the absolutely silent motor, but the important point to the user is relative noise. Mr. Roberts (English Electric) said a noisy motor in a boiler shop could be considered a quiet one and the mere measurement of noise without consideration of background noise was meaningless. Mr. Steward said testing was of paramount importance as even on machines apparently identical in design slight differences in air or bearing clearance were sufficient to cause one of the motors to be unsuitable from the point of view of noise emission. The only safe procedure was to test all "super silent" motors in a specially constructed and equipped silent testing room, but even then considerable discretion must be exercised as the results in the testing room might be quite different from those on the installation. The A.E.G. Electric Co. aims at reducing the effects of upper harmonics by the stepped rotor in which two or four sections are mounted beside one another on the shaft in herring-bone formation. Special air-inlet (near the floor) cowling to reduce windage noise on Metrovick high-speed mining motors, resiliently mounted cradle bases on Batwin capacitor-start induction motors and the use of a composition (bonded linen sheets) spur wheel on the first reduction in Higgs gear units are other contributions to noise elimination.

missioners' permission before connecting to the neutral, in each specific case, the apparatus could be designed to function within limits the Commissioners would state. For example, if the site resistance is over 100 ohms then it is preferable to connect the trip coil to the neutral, but if this were done when the site resistance was only 50 ohms and the leakage switch would keep on tripping until connected in the conventional way, the protective gear would not only obey the Commissioners' ruling, but would afford protection at low voltage no matter how high the site earth resistance conditions might be.

A. G. BULLEN.

Liverpool, *August 8th.*

Two-part Tariff Fixed Charges

WHILE there appears to exist a wide diversity of opinion as to the desirability of some of the recommendations in the McGowan Report, there can be no possible doubt that the results so far achieved by the efforts of the Electricity Commissioners in the direction of standardisation of system of supply throughout the country has produced a semblance of order out of chaos, with corresponding advantage to the consumer and the industry as a whole.

Thus, Stage 1 of rationalisation as represented by the adoption of a national standard system and pressure of supply throughout the country is nearing beneficial completion, and I would suggest that it will be generally agreed that Stage 2 might advantageously be to make a serious attempt to co-ordinate methods of charging for electricity, and in particular to secure the adoption of a standard basis for domestic two-part tariffs with a single method of determination of the fixed charge component.

It is of secondary importance whether the fixed charge is assessed upon floor area, rateable value, wattage installed, number of rooms, or any of the other usual methods so long as some national method of assessment is arbitrarily determined and agreed upon. The existing variations of basic charges for domestic supply are no less confusing and undesirable than were the chaotic variations in systems of supply before standardisation was introduced.

Doubtless it would cause some consternation if a person called at an hotel and asked for two Imperial pints, and the barman said "We sell the juice by the pound—but there is a place down the road where they charge according to chest measurement." I suggest that the existing anomalies in assessment of fixed charges for two-part tariffs are quite as absurd as this hypothetical farce and the only hope of reform appears to be by the initiative of the Electricity Commissioners.

Naturally, and for purely economic reasons, the actual amount to be charged per pound of rateable value or per room (whatever the finally adopted basis may be) would have to be determined separately by each supply authority and governed by local financial considerations, but it would represent a positive step forward in rationalisation if a national basis for assessment of the fixed charge component for a two-part tariff were adopted which could be easily understood by the consumer and would facilitate comparison of electricity charges as between one district and another.

It is suggested that such a proposal is entirely practical and that the determination of a suitable basis might be settled by taking a vote of undertakings upon a schedule of existing basic charges at present in operation.

Personally I see no reason why there should not be a conventional or national method for charging for any commodity and it is impossible to justify the bewildering variety of tariff formulæ which exists throughout the country at the present time.

Obviously there must be a best method of measuring any commodity and it would be of inestimable value to consumers generally and the supply industry as a whole if the Electricity Commissioners, after making a referendum, would as a first step in the co-ordination of electricity tariffs, prescribe a national statutory basis for two-part domestic tariffs.

Swinton and Pendlebury, *August 11th.*

H. C. BUSBRIDGE, A.M.I.E.E., *Borough Electrical Engineer.*

Safety in Mines

In the Report of the Royal Commission on Safety in Coal Mines (Cmd. 5890) mention is made on page 368 of the "practicability of adopting some specified minimum standard of insulation resistance with which electrical apparatus in use in mines must comply." In the recent presidential address to the Association of Mining Electrical Engineers, reference was also made to a possible difficulty in complying with such a minimum standard, a hypothetical condition of "humidity" being quoted to support this viewpoint.

What appears to be overlooked in this connection is the fact that, for a period extending over very many years, no practical engineering difficulty has been encountered in complying with the similar regulation applicable to nearly every other industry in the country. There is, in coal-mining, no greater difficulty in being able to comply with a regulation specifying minimum insulation resistance than in the case of many other industries in which explosive dusts, fumes, heat or humid conditions are prevalent or expected. What is the special difficulty in the coal-mining industry, if any?

August 14th. RESEARCH.

Important Sheffield Schemes

PURSUING the extensive distribution reorganisation scheme approved last year and estimated to cost £208,500 the Sheffield Electricity Department has installed 100 new circuit-breakers at points where the equipment has been inadequate, and 60 new relays have been fitted to improve the reliability of the system. Many schemes are also maturing for giving duplicate supplies to important consumers. These facts are revealed in the latest annual report of Mr. J. H. Struthers, general manager and engineer.

The methods of laying mains have been modified to secure more efficient use of the cables with better sectionalising facilities, and the planning of extensions to mains and sub-stations has been put on a firm basis to ensure full provision for future developments. A start has also been made on bringing the very extensive mains records up to date. To provide more room for the meter section and better accommodation for stores and vehicles a scheme has been approved for reconditioning the Department's old property at Kelham Island. The principle of annual contracts has been extended to cables, transformers and switchgear, which is considered to be of financial advantage to the Department and to provide better facilities for maintaining stocks of spare equipment. A comprehensive system of A.R.P. is also being carried out at an estimated cost of £96,222.

Power Station Extensions

Important extensions are in hand on the generating side. At Blackburn Meadows No. 2 station a new Met.-Vick 50,000-kW turbo-alternator has just been completed and extensions of the station are being proceeded with to accommodate a further 50,000-kW set. Two new 187,500-lb.-per-hr. boilers have been brought into use and a third is nearing completion, while the erection of three further boiler units is being commenced. Two new concrete cooling towers of 3½ million gallons per hour have been built, additional coal handling plant brought into use, and new ash handling plant is nearing completion. No. 3 main switch-house containing 31 Reyrolle "M" switches having a rupturing capacity of 1,500 MVA was brought into use during the year, No. 4 feeder switch-house will soon be in full commission, and No. 2 switch-house at Neepsend is in half commission.

Owing to one of the 30,000-kW turbo-alternators at the Neepsend power station having been out of commission since September last the coal and general operation costs have been adversely affected as it has been necessary to make more use of the low-pressure plant.

Sales and Revenue

Sales of electricity within the Department's area during the year rose by 9.6 million kWh (2 per cent.) to 552.1 million kWh, but tariff reductions which came into force last autumn resulted in a decline in revenue from £1,507,638 to £1,497,360. Excluding income from the installation and motor department the average revenue per kWh sold fell from 0.632d. to 0.615d. Expenditure increased from £1,267,830 to £1,357,614. The net profit was £183,843 compared with £298,020 in the previous year, and has been allocated as follows: Meters, £53,005; depreciation and provision for showroom, &c., £97,419; and reserve fund, £33,419. The gross capital expenditure on the undertaking to date is £10,087,545 (£718,854 increase during the year) and the debt outstanding is £5,106,690.

The number of consumers increased during the year by 4,498, to 160,907. Nearly 2,000 additional electric street lamps were installed, making the total 11,615, and in the industrial field three new steel melting furnaces were added, making the total number 60; at the end of the year the capacity of electric furnaces connected to the mains was 50,300 kVA compared with 43,700 kVA a year before.

South Wales Conversazione

THE South Wales Institute of Engineers is holding a conversazione at the National Museum of Wales, Cardiff, on Thursday, September 21st. Among those invited to attend are members of the local branches of the Institutions of Civil, Electrical and Mechanical Engineers and the Association of Mining Electrical Engineers, with their wives.

NEW ELECTRICAL PRODUCTS

A Review of Equipment Recently Marketed

Wire-wound Embedded Resistances

"CERAMITE" wire-wound embedded resistances are now being manufactured by a new process by the ZENITH ELECTRIC CO., LTD., Villiers Road, Willesden Green, London, N.W.2.

Modern requirements have created a need for resistors of high ohmic value, of comparatively small size, characterised by stability of ohmic value. The requirements of high ohmic value necessitate the employment of resistance wires of the finest possible gauges, which are essentially delicate and fragile, and reliability necessitates that such wires should be embedded in and protected by a covering impervious to moisture and to the attacks of acids, alkalis or other deleterious substances.

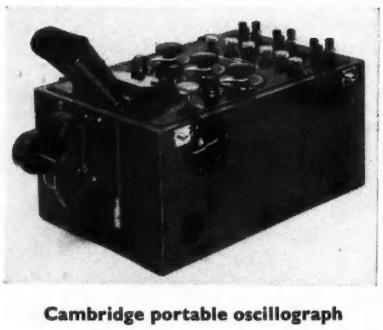
This class of resistor should be capable of withstanding high overloads and repeated heating and cooling, without developing flaws, crazing or cracks.

It is claimed that the requirements are met by the "Ceramite" embedding process which imparts considerable mechanical strength and resistance to chemical attack and, being akin to porcelain enclosure, also has very high insulating properties.

Portable Oscillograph

An oscillograph which is readily portable for convenient use "in the field" has been developed by the CAMBRIDGE INSTRUMENT CO., LTD., 13, Grosvenor Place, London, S.W.1. Its weight and size allow it to be carried easily by one person, while the quality of the records is comparable with that obtainable from much more elaborate equipment.

The instrument is independent of external sources of electricity, other than a 12-V accumulator suitable for discharging at the 2 Ah rate. It is contained in a teak case with a leather carrying handle, a removable hinged lid and a hinged side-flap providing access to the vibrator and lamp compartments. Three masked lenses focus an image of a 12-V, 24 W lamp on each of three permanent magnet vibrators. Rotating mirrors, operated by a spring-driven motor, enable the traces to be seen up to the time of making a photographic record.



Cambridge portable oscillograph

Each vibrator may be rotated horizontally or vertically about the axis of its mirror and each has an adjustable resistance which may be connected as a series or shunt control. A fuse in each circuit prevents damage to the vibrator suspension strips, while a graduated screen facilitates calibration of the vibrators.

All of the controls, together with the fuses, reversing switches, a hood for the rotating mirrors and a mirror motor speed regulator, are fitted on a metal panel beneath the hinged lid. For convenience in transport, the hood and camera can be removed and fitted inside the case.

The vibrators are of the low-frequency, oil bath type with a resistance of 2 ohms and taking 0.1 A maximum. Their sensitivity at 30 cm. is 1.75 mm. per mA and their natural frequency, undamped in air, is 3,000 cycles per second.

The camera fits into guides at one end of the oscillograph, takes standard Kodak "Verichrome" G22 film, and may be loaded and unloaded in daylight without fear of fogging. The width of the film is 2¼ in. and the average length of each exposure is 3¼ in., giving seven exposures on the standard length of film, which may be made in rapid succession at speeds up to 2 metres per second by means of a manually operated handle.

The time marker is an electrically maintained 100-cycle tuning fork which is driven from a 12-V, DC source and requiring about 0.25 A and housed in a separate teak box with carrying handle. The output terminals may be connected to one of the vibrators so that timing lines 0.01 sec. apart may be recorded on the edge of the film.

Home Sunlamp

In the sunray lamp made by COLLARO, LTD., Culmore Works, Culmore Road, London, S.E.15, two pairs of high-grade medical carbons are mounted upon a hard heat-resisting panel, the lower two carbons being clipped into stationary spring holders and the upper two clamped securely into a specially designed holder adjustable in a vertical direction by means of a screwed spindle with an insulated knob projecting through the top of the lamp reflector.

The upper and lower pairs of carbons are mounted with their tips nearly touching, and the arcs are ignited by depressing the top insulated knob so that the upper carbons push the lower carbons down through their spring holders for a distance limited by a stop. When the knob is released gently the top carbons are drawn up by means of a spring, drawing out the two arcs and automatically giving the correct spacing. As the carbons burn away the knob at the top is turned occasionally to maintain the original gap. A polished aluminium reflector plate is mounted behind the arcs. Also mounted on the heat resisting panel are two elements for the radiation of infra-red rays, these being connected in series with the ultra-violet carbon arcs and mounted in such a way that the maximum emission is obtained.

Collaro sunlamp

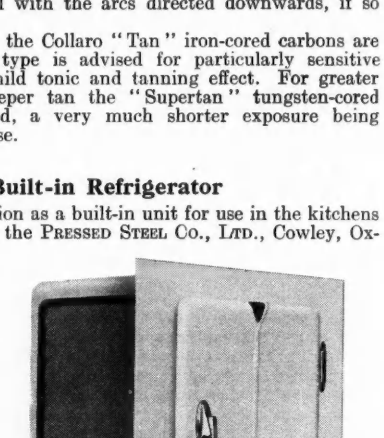
The complete unit is assembled in a highly polished aluminium bowl with an attractive vitreous-enamelled base, and the front is protected by a wire mesh screen. The lamp can be set at any angle on the base and the base can be mounted on a wall with the arcs directed downwards, if so desired.

For ordinary use the Collaro "Tan" iron-cored carbons are suggested. This type is advised for particularly sensitive skins, and for a mild tonic and tanning effect. For greater benefits and a deeper tan the "Supertan" tungsten-cored carbons are offered, a very much shorter exposure being necessary with these.

Built-in Refrigerator

For easy application as a built-in unit for use in the kitchens of flats and houses the PRESSED STEEL CO., LTD., Cowley, Oxford, has introduced a refrigerator with a gross food storage capacity of 3.6 cu. ft. and a shelf area of 8.6 sq. ft.

The two ice-trays make 3¼ lb. of ice per freezing in 32 cubes. The freezer is centrally placed and eight-point cold control is provided. Ventilation louvres are situated below and at the side of the motor compartment. The lower panel is removable, giving easy access to the motor, which is a ⅛-HP machine rubber mounted with spring suspension driving a single-cylinder compressor.



"Prestcold" built-in refrigerator

The exposed parts of the exterior frame are finished in white lacquer and the unexposed parts are rust proofed and given one coat of paint. The hardware and fittings are heavily chromium plated and the shelves are hot tin dipped.

THE OUTLOOK IN IRAQ

British Manufacturers' Position and Prospects

By W. H. Peters (Baghdad)

IT is befitting before describing present-day conditions in Iraq and the stage of development reached, to review the history of the post-war period. Both Baghdad, as capital city, and Basra as Iraq's modern seaport, were left electricity systems installed by the British Army during the occupation. As war products they were limited in capacity, of antiquated design, and very expensive in upkeep, and it is only during the past decade that these supply undertakings have been transferred to concessionaires or the Government.

The delay in these transfers undoubtedly restricted electrical development and trade. The cost of electricity was so high in those days that even the household ceiling fan was considered a luxury, and other appliances were ruled out. But intensive electrical development has taken place during the past seven years in Baghdad, Basra, and Mosul. In the districts, however, there has been steady advancement for the past fifteen years for most provincial centre towns showed initiative and resourcefulness in the promotion of schemes for small plants, primarily to serve the requirements of the administrative authorities for fans as well as street lighting.

Oil-Engine Sets

With the exception of the turbo-alternator sets in Baghdad, the prime movers for generating sets have been heavy oil engines. In the provincial centre towns in the early stages, the horizontal four-stroke type with DC generators were installed, and to-day this system applies in the smaller towns. Latterly, the larger towns of Kirkuk, Hillah, Najef, and Kerbela have changed over to AC transmission, and while increasing their station outputs are now concentrating on the use of low-speed vertical Diesels. In few cases do the rates exceed 6d. per kWh for lighting. There is little demand for power for industrial purposes, although most of the water pumping is carried out by electric motors.

The largest supply undertaking is that in the capital city, Baghdad (population approximately 250,000), and is unique, being the only one of foreign ownership. It is directed by the Baghdad Light & Power Company, registered in the United Kingdom. The company's new power station accommodates a most up-to-date 10,000-kW plant, considerably more than sufficient to meet the present requirements of the concession area, the maximum load recorded being about 3,000 kW. The number of consumers is approximately 16,000.

The main thoroughfares of the city are copiously lighted, the load exceeding 300 kW. The station capacity comprises one 5,000-kW Parsons turbo-alternator and two 2,500-kW Brown Boveri sets. The annual output is approximately eight million kWh (1¼ million is used by the Baghdad Water Board).

With the high standing reputation of the Port of Basra it is no matter for surprise that the port authorities set up an efficient power station five years ago, and the sale of energy in the port premises and the municipal area has exceeded all expectations, a progressive policy having brought about a highly satisfactory position. The total number of consumers is 3,900, and the capacity of plant will shortly reach 2,100 kW. The output last year was three and a half million kWh. The rates of supply to the public are the most reasonable in the country, *viz.*, 18 fils, or 4½d., for lighting, 10 fils, or 2½d., for domestic power.

Having had no regular efficient supply prior to 1932 the northern town of Mosul has shown outstanding progress since that date, when an 800-kW plant of Belliss & Morcom and Metropolitan-Vickers manufacture was installed. Further plant is now about to be installed to a capacity of 425 kW and the municipality is to be congratulated on an efficient undertaking.

Within a year the Iraqi State Railway will be finally completed to this city to permit of rail-borne goods traffic both westwards to Syria and southwards to Basra, apart from the coaching traffic passing on route: Basra, Baghdad, Syria, Turkey, and on to Europe. This great need once fulfilled is likely to develop the import and export trade of Mosul, thereby increasing its prosperity, and it is predicted confidently that the demand on the existing station will be much augmented in a very short period. To-day there are almost 5,000 consumers, and the maximum load recorded is about 450 kW and the station has an annual output of about two million kWh.

Until three years ago all the Diesel power stations were run by plant entirely of British origin, but in the past three years competition has been fierce, and German plant has made considerable headway. In spite of this a contract of particular interest was awarded to Belliss & Morcom with Metropolitan Vickers, who are to install in the next few weeks two 300-kW and two 75-kW sets for the Ministry of Defence at Musaiyib.

Iraq's exports of oil and agricultural produce show a very satisfactory increase year by year, which are contributing to increased national wealth and an improved standard of living, which is not confined to the property owners and monied classes, but is discernible almost everywhere. It will be appreciated that a wider field will be opened for electrical development as this progress continues, as it no doubt will.

The value of imports of all electrical equipment is shown below. The United Kingdom, while taking a leading share, will have to exert a keener effort if she is going to maintain it.

	1936 I.D.	1937 I.D.	1938 I.D.
Total value from all countries ...	198,391	189,972	242,322
United Kingdom	132,918	106,525	130,859
United States	25,545	33,114	44,418
Germany	17,294	25,683	31,795
Holland	9,087	8,816	13,716
Japan	4,236	6,115	3,609

The chief items amongst these electrical imports are as follows:

	1936 I.D.	1937 I.D.
Dynamos and motors—		
Total from all countries ...	26,651	23,188
United Kingdom	20,513	15,199
Germany...	4,542	4,218
Batteries and accumulators—		
Total from all countries ...	8,951	11,257
United Kingdom	4,969	6,462
United States	2,431	2,847
Germany...	1,342	1,538

	1936 I.D.	1937 I.D.
Lamps and tubes for lighting—		
Total from all countries ...	8,004	11,785
United Kingdom	3,953	6,841
Japan	2,507	2,329
Insulated cables—		
Total from all countries ...	18,333	25,872
United Kingdom	13,549	19,584
Germany...	2,590	2,999

	1936 I.D.	1937 I.D.
Electric fans—		
Total from all countries ...	18,086	29,301
United Kingdom	10,023	13,728
United States	5,759	5,775
Italy	—	3,961
Germany...	718	3,562

I.D. = Iraq dinars. Dinar = £ sterling.

Iraq being fundamentally an agricultural country has witnessed little growth in industrial development, and there is only a small trade to be done in motors for driving machinery in such establishments as small textile factories, footwear and cigarette factories.

Refrigerators

Household refrigerators are coming into increasing use in the cities and American models have almost the entire field. The refrigerating mechanisms are electrically driven, and with their low energy consumption these domestic units make a strong appeal to householders for the preservation of food during the country's seven months hot season. British manufacturers interested in exploiting this potential market will be wise to investigate closely the rigorous conditions of the climate in which such units must give complete satisfaction.

Apart from the European houses, who have become moderately established in the past few years, commission agents are active in placing small indents in the cheapest markets of the world for the dealers; the latter lack adequate capital to place substantial orders. It is significant that many of the most active dealers attend to wiring installation contracts in addition to their sales. These dealers or small merchants are accustomed to do business on the basis of letters of credit opened through the local banks, and British suppliers will be prudent to avoid business which is not on such a basis.

While advertising in the local Press is beneficial to a limited extent a prominent display of specialities in showrooms is found effective. Quotations and offers for goods should be in sterling and on the basis of c.i.f. Baghdad, through bills of lading to this inland water port being easily obtainable. Transit time from the United Kingdom to Baghdad averages two to three months.

The customs tariff is fundamentally a basis for revenue: rates of duty are not high, ranging from 8 per cent. *ad valorem* in the case of plant to 20 per cent. in the case of lighting fittings and radio equipment. It is noteworthy that Britain enjoys no commercial privileges in Iraq and only good quality goods at moderate and competitive prices will enable British manufacturers to retain the market which they enjoy and advance their position where they are at present backward, as with radio equipment and domestic refrigerators.

PERSONAL AND SOCIAL

Information regarding new appointments and other matters of interest for this page are welcomed

THE post of lecturer in electrical engineering which has recently been established at Kings College, Newcastle, will be held by **Mr. J. A. Lyddiardd,** who takes up his appointment on October 10th.

Mr. A. Nichols Moore, M.I.E.E., M.I.Mech.E., has seen a number of changes and improvements in the electricity supply at Newport during the twenty-seven years that he has occupied the position of borough electrical and transport engineer there, and a review of the most recent developments appears earlier in this issue. Mr. Nichols Moore received his training at the Sheffield School of Technology (now Sheffield University) and with Mr. W. J. Walker, consulting engineer, of Westminster, and was a pupil with the Brush Electrical Engineering Co., Ltd., Loughborough. From 1899 to 1904 he was charge engineer successively to the Hull Electricity Department, the Sheffield Tramways Department and the Manchester Electricity Department. In 1904 he was appointed assistant resident engineer at Stuart Street power station, Manchester, and in the following year obtained an appointment as resident engineer with the Belfast electricity undertaking. In 1907 he was appointed to the position of deputy city electrical engineer at Belfast, which he held until taking up his present position at Newport in 1912. Mr. Nichols Moore is a past chairman of the Western Centre of the I.E.E., a past president of the I.M.E.A. and one of their representatives on various allied associations, and a past president of the A.M.E.E. He is also chairman of the C.E.B. Consultative Committee for the South-West England and South Wales Electricity Area, and this year he was elected chairman of the E.D.A. Council.

[*Elliott & Fry.*

Mr. A. Nichols Moore

Mr. J. C. Petersen has retired from the position of secretary to South Shields Corporation Electricity Department after forty-three years' service with the Corporation. He is the longest serving member of the electricity staff and is the only one who was present at the inauguration of the undertaking in 1897. He has worked under seven chief engineers. A gold watch has been presented to him by Mr. W. J. Blyton, chairman of the Electricity Committee, on behalf of the staff.

Mr. T. Harding, superintendent of the cable department of the Helsby Cable Works of British Insulated Cables, Ltd., has received gifts from the staff and workpeople, on his retirement after fifty-two years' service.

Mr. and Mrs. Denis Z. de Ferranti distributed the prizes on the occasion of the seventh annual sports and gala of the Ferranti Recreation Club, at Hollinwood. One of the most interesting of the inter-departmental events was the tug-of-war, which the meter maintenance team won after a hard-fought battle with the foundry team.

Mr. G. R. Laithwaite, who, as we announced in our last issue, succeeds Mr. M. S. Mason as borough electrical engineer at Worksop, was born in Wigan and received his early education at St. Chad's College, Denstone, and the County Technical College, Wigan. For fifteen years he was with the former Wigan Coal & Iron Co., and in 1931 was appointed mains engineer to the Worksop Corporation. In 1934 he was appointed deputy borough electrical engineer and manager.

Mr. G. R. Laithwaite

The scholarship, of the value of £100 annually and tenable for three years at a British university, awarded by Lloyd's Register of Shipping on the results of the 1939 Studentship examination of the Institute of Marine Engineers has been won by **Mr. J. Sloan,** apprentice to Harland & Wolff, Ltd., Belfast, and a student at Belfast College of Technology.

Mr. A. C. Hansen, secretary to Mr. P. J. Robinson, city electrical engineer, Liverpool, is shortly to retire on superannuation, after forty-five years' service dating from the days of the Liverpool Electric Supply Co., Ltd.

Mr. R. C. Golding, M.Sc., A.M.I.E.E., has recently been appointed mains engineer to the West Bromwich Corporation and he will take up his new duties on September 1st, after which date his address will be the Corporation Electricity Department, High Street, West Bromwich. Mr. Golding received his technical training at the Rugby College of Technology and Arts, and was apprenticed to the B.T.H. Co. He joined the Leicestershire and Warwickshire Electric Power Co. as senior mains assistant at the company's Kibworth office, and in 1933 was appointed technical assistant in charge of mains at the Caernarvon office of the North Wales Power Co. Since October, 1934, he has been employed in the operation department of the Central Electricity Board at Bristol.

Mr. L. J. Restall has been appointed general sales manager of the Union Lamp & Lighting Co., Ltd. Previously he was export manager of Thorn Electrical Industries, Ltd. (Atlas lamps) from which position he resigned to take up his present post. From 1928 to 1936 he was director, manager and secretary of the Meteor Electric Lamp Co., Ltd.

[*Haines*

Mr. L. J. Restall

Mr. P. Massey, B.Sc. (Econ.), F.R.Econ.S., has been appointed editor of research and will undertake the supervision of the research activities of the School of Planning and Research for National Development. He will continue his practice as an economist and statistician from his office address.

Mr. W. H. Cook, chief buyer at the radio and telephone works, Coventry, of the General Electric Co., Ltd., retired on July 31st after fifty-two years' service. He joined the G.E.C. in the days when Lord Hirst (then Mr. Hirst) and the late Mr. G. Byng were laying the foundations of the business. Early in his career Mr. Cook was at the company's Salford works, before the Witton works were built. He took an active interest in the social activities of the company at Coventry, and served on several social committees. A complimentary luncheon was given to him on July 28th, at which Mr. H. P. Wells, manager of the Coventry Works, made a presentation to him.

Mr. C. D. Taite has presented to **Mr. and Mrs. Norman H. Bridge,** on the occasion of their marriage, a silver tea service and canteen of cutlery on behalf of the management and staff of the Lancashire Electric Power Co. Mr. Taite, in making the presentation, referred to Mr. Bridge's career with the company and the good work he had done. He expressed his pleasure at the marriage of two such well-respected members of the staff. Mr. Bridge thanked the donors in a witty speech. This marriage is an electrical alliance in the fullest sense, as Mrs. Bridge was in charge of the company's showrooms at Ramsbottom and is the daughter of Mr. C. E. Leak, of Siemen's Electric Lamps & Supplies, Ltd., Manchester. Mr. Bridge is publicity manager and editor of the company's staff magazine and son of Mr. A. H. Bridge, former editor and a director of the ELECTRICAL REVIEW.

Mr. S. W. Fuller has been appointed by E. K. Cole, Ltd., as sales manager for "Ekco" lamps. He has been with Ensign Lamps, Ltd., since January, 1937, serving latterly as northern sales manager. Previously he was with Crompton Parkinson, Ltd., and he has had ten years' experience in the lamp industry. The "Ekco" lamp sales organisation will operate under the direction of **Mr. M. I. Lipman,** electrical sales manager.

OBITUARY

Mr. W. Cornet.—We regret to announce the death on July 31st, after a short illness, of Mr. W. Cornet, of the London Western Section of the Electrical Power Engineers' Association. Mr. Cornet had been an enthusiastic member of the Association for twenty-two years, and during that period he had been very actively engaged in its interests, as section secretary and later section chairman, as a member for many years of the No. 10 Area Investigation Committee and the Southern Divisional Council, and latterly as a member of the National Executive Council and the staff side of the National Joint Board. He was a charge engineer with the Battersea Borough Council, and previously was for many years in a similar position with the Barnes electricity undertaking.

Mr. Eric P. Barfield, whose death we briefly reported in our last issue, was one of the founders of Wild-Barfield Electric Furnaces, Ltd., managing director of the company since its

incorporation in 1917, and chairman since last September, and was a director of its associated company, G.W.B. Electric Furnaces, Ltd. He was a pioneer in the electrical industry, commencing with the Edison & Swan Co. He then joined the National Telephone Co., and was responsible for the installation of some of the first lead-covered, paper-insulated telephone cables in the country, and at a very early age was manager of one of the largest South Coast telephone exchanges of that day. Later he joined the head office staff of the General Electric Co., Ltd., and subsequently was connected with the development of the Robertson lamp. From there he went to Siemens Bros. to develop the manufacture and sale of tantalum lamps.

[Elliott & Fry.
The late Mr. E. P. Barfield

Some years later in conjunction with Mr. L. W. Wild, whom he had known for many years, he founded Automatic & Electric Furnaces, Ltd., and so formed the first company in this country to make industrial electric heat-treatment furnaces. Commencing with the manufacture of relatively small and specialised furnaces for the precision hardening of tools and gauges, his company gradually developed the larger furnaces, basing designs on the experience gained, until at the present day it and its associated company, G.W.B. Electric Furnaces, Ltd., construct resistance furnaces of every type, including some of the largest installations in the world. Mr. Barfield was actively associated with the company almost until his death, which occurred after an illness of less than five weeks. He had a very wide circle of friends in the engineering and electrical industries. He married the only daughter of the late Mr. Harry Davy, of Exeter and London, who survives him.

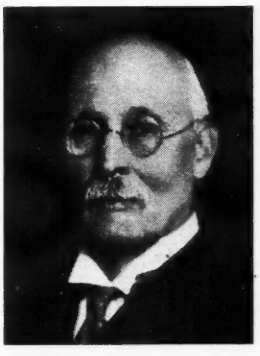
Mr. V. Lindop.—The death occurred in Argentina on July 7th at the age of sixty-eight of Mr. Vernon Lindop, who retired from the chairmanship of the local board of the River Plate Electricity Co. in 1923 upon its absorption by the C.H.A.D.E. Mr. Lindop was born in Birmingham, and was educated at King Edward's Grammar School. He went to Argentina in 1888, entering the service of the River Plate Electricity Co. at La Plata. According to the *Review of the River Plate*, he erected the company's power station at Tres Esquinas in 1892, and was transferred to Tucumán in 1895 as manager, erecting the power station in that city. He returned to La Plata in 1900 as managing director and chief engineer, later becoming chairman of the local board. Subsequent to his retirement from the River Plate Co. he was for five years chairman of the local board of the La Plata Tramways Co.

The late Mr. S. D. White, a director of the General Electric Co., Ltd., whose death was recorded in our last issue

Llewelyn B. Atkinson

WITH the passing of Mr. Llewelyn Birchall Atkinson, whose death on August 9th was briefly announced in our last issue, the electrical industry has lost yet another of those whose early pioneering activities formed a valuable contribution to the establishment of the industry as we know it to-day.

Born at Builth Wells, Brecknockshire, in 1863, Mr. Atkinson was educated at Merchant Taylors' School and gave special attention to physics and chemistry, with the result that on leaving he was awarded an Exhibition at St. Thomas's Hospital. He did not, however, take this up, having decided to adopt his father's profession of civil engineering. In 1880 he attended Prof. Ayrton's lectures on electricity at Cowper Street Schools, Finsbury, before the Finsbury Technical College was built, and in 1881 he won the first prize and silver medal in the City and Guilds of London Institute's examination. For three years he studied at King's College, London, where he was awarded the Telford medal for gaining the highest marks in both his second and third years.



[Elliott & Fry.
The late Mr. Ll. B. Atkinson

After serving his apprenticeship with Kitson & Co., locomotive builders, of Leeds, he became associated in 1886 with Goolden & Trotter, taking out his first patent in the same year—a dynamo brush constructed of layers and intervening resistances for the prevention of sparking. In the following year he studied the application of electricity to mining, and took out many patents in connection with coal cutting and other machinery. He spent some time practically working at the coal face, and designed an improved cutter bar. In collaboration with his brother Claude he presented a paper before the Institution of Civil Engineers in 1891 on "Electric Mining Machinery," which was awarded the Telford gold medal and premium.

Mr. Atkinson became a partner in the firm of Goolden & Co. upon the retirement of Mr. Trotter in 1888, and in 1893 the business of the company was amalgamated with that of Easton & Anderson under the title of Easton, Anderson & Goolden, Ltd., of which Mr. Atkinson became a director until his retirement from the company in 1897. In the following year he read an important paper before the Institution of Civil Engineers on the "Theory, Design and Working of AC Motors" which was awarded a Telford premium. That paper was long before its time, containing the fundamental principles of almost every kind of AC motor, anticipating many later inventions.

In conjunction with the late Mr. R. J. Fawcus and others, Mr. Atkinson founded the Trafford Park Power & Light Supply Co., Ltd., the first company to be formed in this country with the primary object of distributing cheap power over an industrial area. Following upon the reorganisation of W. T. Glover & Co., Ltd., in 1903, he became a director, which position he held for seventeen years.

His connection with all aspects of the cable-making industry, both on its manufacturing and commercial sides, had been so long and so intimate that he had acquired to a unique extent the broad mental background which enables accurate and properly balanced conclusions to be rapidly arrived at on most problems. His connection with the Cable Makers' Association commenced in 1916 when, upon the death of Mr. A. H. Howard, he became secretary and manager of the Association, subsequent becoming Director and retiring from that position in 1936. His services were retained, however, in the capacity of Advisory Director. He also held the position of chairman of the Joint Industrial Council for the Cable-making Industry, and was a past-chairman of the Telephone Development Association.

Mr. Atkinson became a member of the I.E.E. in 1900, and in 1918 delivered the tenth Kelvin lecture to the Institution on "The Dynamical Theory of Electric Engines." He was elected a member of the Council of the I.E.E. in 1917, became a vice-president in 1919, and was president in 1920-21. His presidency was marked by the granting of a Royal Charter to the Institution. In the acquisition of this Charter he was one of the moving spirits, and was, as president, the signatory to the Petition. A copy of the Petition, and of the Grant, is reproduced as a standing introduction to the by-laws of the Institution and in this way Mr. Atkinson's name is permanently associated with this important event in its history.

The wide range of Mr. Atkinson's intellectual activity was well illustrated by his presidential address to the Institution which presented a wide survey of the contemporary position of electrical science. This, we know, was written entirely "out of his head," but to many who were not aware of his range of thought it must have seemed the result of widespread inquiry among experts in many branches of science and practice.

He had travelled extensively both on the Continent and in the United States. His inventions and patents covered a wide range, including mining machinery, DC and AC apparatus, electrical instruments and demand indicators.

His scientific interests embraced the whole field of modern philosophical physics, and even in such recondite matters as quantum theory, wave mechanics, and relativity he was always an interesting and suggestive conversationalist. One of his most engaging features was the zest with which he would enter into pursuits quite foreign to his professional work. With a little encouragement he was always ready to dispense novel and useful information on a great variety of subjects, not excepting such things as the rotation of crops and the successful incubation of chickens.

To all his active interests he brought a degree of humorous enthusiasm and a kind of *joie-de-vivre* that were always most refreshing. He was blessed with a singularly happy family

(Continued at foot of next page.)

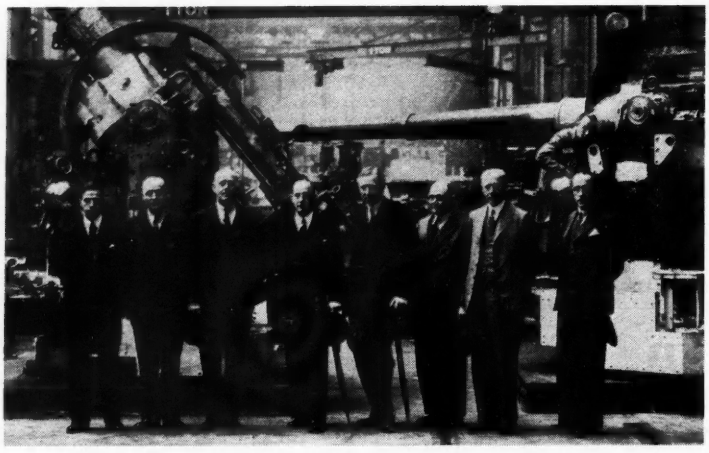
COMMERCIAL and INDUSTRIAL NEWS

Royal Lancashire Show. Electrical Plant for the G.W.R. Domestic Electricity in Schools. Hotel Lighting Installation.

Fair Trading Policy

THE Fair Trading Policy of the Electrical Fair Trading Council has now been reproduced in pocket-size form with all amendments to date. In re-issuing the Policy in the new form the Council hopes that the document will commend itself to all who are directly concerned with the manufacture and/or distribution of electrical products within the scope of the Policy's aims and objects as a convenient booklet which every member of their relevant personnel can carry about as a constant work of reference on all commercial matters that are appropriate. It is also hoped that the manufacturers and distributors concerned will find it possible, if they have not already done so, to adopt the policy and to issue the document to their respective staffs as definite instructions.

A large number of copies will be distributed to the industry during the next few weeks, but meantime any firm which is directly concerned is invited to apply to the Council at Kern House, Kingsway, London, W.C.2, for a specimen copy of the new edition which will be sent free of charge. Alternatively, any quantity of the document may be obtained by approved firms at the cost price of 2s. per dozen, post free.



At the works of the Metropolitan-Vickers Electrical Co., Ltd.

Left to right: Mr. Burgin, jun.; Mr. T. Dooley (supt., west works, Met.-Vick. Co.); Mr. G. E. Bailey (director and general manager of works, Met.-Vick. Co.); Rt. Hon. E. Leslie Burgin (Minister of Supply); Engr. Vice-Admiral Sir Harold A. Brown (Director-General of Munitions Production); Engr. Capt. R. Rampling (Inspectorate of Carriages, W.O. Armaments Inspection Dept.); Mr. J. S. Peck (director and chief electl. eng., Met.-Vick. Co.); Mr. R. Johnson (manager of the Company's marine dept.)

Minister of Supply Visits Electrical Works

Mr. Leslie Burgin, Minister of Supply, accompanied by Engineer Vice-Admiral Sir Harold Brown, Director-General of Munitions Production, made a tour of several engineering works in Lancashire of August 10th. The morning was spent with the Metropolitan-Vickers Electrical Co., Ltd., at Trafford Park, where, by the invitation of Mr. George Bailey, director and general manager of the company, Messrs. Vincent and Denis de Ferranti joined the party at luncheon. Our picture shows the visitors with some officials of the Met.-Vick. Co. in a department given up to the manufacture of anti-aircraft guns, sound locators and other armament equipment. In a statement to Press representatives Mr. Burgin said that the company was the first of the large electrical groups to devote its skilled management, experience and labour to Government problems, and he paid special tribute to the company as pioneers, not only for its willingness but also for the success it had achieved in this direction.

In the afternoon the Ferranti works at Hollinwood and Moston were inspected. In addition to the normal products of the company a large variety of high-precision work for the armed forces was seen in progress. Commenting particularly on what he had seen in the Ferranti works, Mr. Burgin spoke of his satisfaction with the way in which important armament production of a nature calling for accuracy to a very fine degree of tolerance was being carried out.

Later in the afternoon the visitors proceeded to the works of Crossley Bros. before returning to London in the evening.

Domestic Electrification and E.D.A.

An example of the way in which E.D.A. is helping domestic electrification in rural areas is afforded by recent figures relating to the activities of the West Cambrian and Carmarthen companies. To popularise electric water heating two E.D.A. water-heating window displays were exhibited in various showrooms in the area during April, while a large number of water-heating leaflets were posted to consumers. As a result, during the month 70 additional water-heaters and circulators were installed, and in May 42. Three-day cooking demonstrations were given in various parts of the area in April and May and in the first month 82 new consumers and 40 additional cookers were connected, while in May 64 new consumers were afforded supplies and 41 additional cookers were installed. In May also

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Llewelyn B. Atkinson (*Continued from preceding page*)

life which he appreciated to the full and to which, on all occasions he was ready to bear eloquent and touching testimony.

In his closing years he was able to look back on a life of singular fullness, rounded off by the fulfilment of many important tasks and enriched by the respect and affection of a host of friends.

The funeral took place at the Bournemouth crematorium on August 12th and was attended by a large number of well-known men representing the electrical industry in all its branches. A service and interment of ashes will take place this afternoon (Friday) at 2.30 p.m. at Little Hampden Church, Great Missenden, Bucks.

An Appreciation

His work was done, he was in retirement; but who that knew him can forget that vivid, eager, and engaging personality? Even outsiders like myself who knew but little of his public achievements—perhaps chiefly those—were attracted by it. When he entered a committee-room where doubt and divided opinion were evident and dispute impending, a draught of cool air seemed to enter with him; calm, reason, confidence began at once to prevail. Why was that?

Whether as chairman or mere member, he combined two essential business qualifications for making a success of proceedings: an embarrassing knowledge (acquired by advance study) of every side of his subject, enabling him to put formidably and clearly and to hold tenaciously to his views while listening to the views of others; and special personal gifts of patience, agreeableness and humour. A broad general culture and extensive acquaintance with men and affairs contributed to success and made unambiguous the resolutions of any committee with which he sat.

I recall the occasion of his humorous deflation of the enthusiasm of a B.E.A.M.A. committee, the subject matter being their *magnum opus* on "How to Make a Contract." He opened the discussion with the dry remark: "This pamphlet reminds me of a book I have just been reading on the growing of roses: twenty pages on roses and a hundred and fifty on garden pests."

In the give-and-take of private intercourse you took his constant agreeableness for granted, but you would usually be making a mistake if you took for granted that, rationalist and scientist as he was, he would agree with you over some trivial subject where your proper line of approach seemed obvious to you. His knowledge was disenchanting. Nothing was trivial to him, not even the choice of a country cottage for one's retirement, on which I once suggested to him that the deciding factors should be whether you liked it and it "liked" you. After listening to such nonsense he would state the exact scientific grounds for your decision, and the next morning you would probably receive—if you were worthy—a mixed bag of pamphlets setting forth scientifically the climatic conditions, mean temperature, sunshine, rainfall, &c., of every district in the Kingdom.

Some of us were privileged to know where lay the heart of this lovable man. It lay in the country, in amateur farming and the growing of roses. That he will grow no more is a grief to many of us, to those of us especially who were proud to be entitled to say: "He was my friend."—X.

the first electric tar-heating installation in a quarry in the area was connected.

Members of the Association all over the country are at present taking advantage of the facilities offered by E.D.A., which is one of the main reasons for the present rapid progress of domestic electrification. There is still much room for improvement in this direction in certain areas, and to this end it is urged that every supply authority in the country should take advantage of the services offered by the Association.

Siamese Electrical Imports

Mr. W. W. Coultas, H.M. Consul-General at Bangkok, in his report to the Department of Overseas Trade on economic and commercial conditions in Siam (Stationery Office, 1s. 3d. net), states that the steady increase in the demand for electrical goods and apparatus, including machinery, as disclosed by imports during the past four years, was to be expected in a country where the development of municipal amenities is everywhere called for. Since 1933-34 imports have increased by over 100 per cent. both in quantity and value, the figures for 1937-38 being 2,757,007 kg. at 3,013,652 bahts (11 bahts = £1). The United States leads with imports valued at 823,000 bahts (including those *via* Singapore and Hongkong), the United Kingdom's share being 405,000 bahts, exclusive of imports through Penang (280,640 bahts). Japan is the chief supplier of cheap electrical goods and imports from this source amounted to 330,000 bahts. Figures for the first eight months of 1938-39 year show a slight decline. Mr. Coultas draws attention to the growing market in Siam for air-conditioning plant, mainly for private installations. The present demand is met almost entirely by the United States.

An annex to the report deals with conditions in the Longkhla (Senggora) Consular District (South Siam). Here imports of machinery, iron and steel manufacturers and electrical apparatus are chiefly in connection with the tin-mining industry. For customs purposes there are two divisions in South Siam—Puket and Nakawn Sritamaraj. Imports under the above heading into Puket rose from 129,337 bahts in 1936-37 to 234,614 bahts in 1937-38. Those into Nakawn Sritamaraj increased from 105,483 bahts to 121,514 bahts.

Royal Lancs Show

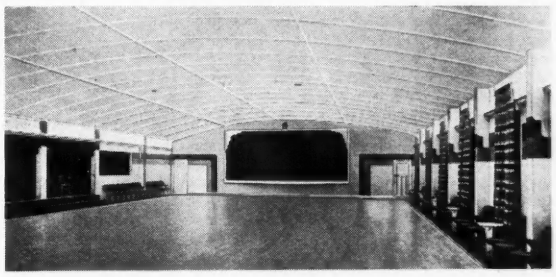
George Formby, the comedian, paid a visit to the Electrical Pavilion at the Royal Lancashire Agricultural Show held recently. The Electrical Pavilion was the joint exhibit of E.D.A. and the electricity undertakings of Lancaster and Morecambe. much of the stand was devoted to electrical equipment for the farm and the home, but a lighter side was provided by a series of working models of designs which Mr. W. Heath Robinson was commissioned to prepare, illustrating his ideas for uses of electricity on the farm and in the home. Examples of Mr. Heath Robinson's designs were an apparatus designed simultaneously to rock the baby and to stir the stew, and a cowshed equipment intended to make one operation of milking a cow, turning the milk into cheese, and boring holes in the cheese.

In spite of the unfavourable weather, the joint stand arranged by the Preston Corporation Electricity Department and the Lancashire Electric Power Co. aroused much interest and drew a large number of inquiries and orders. One half of the stand was devoted to agricultural and horticultural equipment. Poultry appliances included brooders, mash mixers, incubator conversion equipment, and egg testing lamps, while dairy equipment included steam-raising boilers and sterilising chests supplied by the General Electric Co., Ltd., and Martin's Cultivator Co., Ltd., of Stafford. Electrocult, of Harpenden, supplied soil sterilising equipment of various sizes, including the barrow type, and also exhibited low-voltage strip heating equipment for greenhouses. The "Rotoscythe," of Power Specialities, Ltd., was displayed, and Beresford-Stork self-priming pumps were installed. A fountain in the centre of the agricultural side formed a novel feature. Low-voltage lighting and heating equipment for farms by means of step-down transformers, pig stunners supplied by the Cooper-Stewart Engineering Co., and panel heaters for piggeries completed this section of the stand.

On the domestic side, the Lancashire Co. and Preston Electricity Department each had an independent section. A wide variety of domestic appliances, as supplied on hire or hire-purchase by both undertakings, was attractively arranged, and running hot-water displays and a "Ritemp" cooker provided by the English Electric Co. attracted many people. Continuous cooking demonstrations were carried out by demonstrators of both undertakings.

Ballroom Installation

An interesting lighting installation has recently been completed in the new ballroom of Mr. R. Maddieson's holiday camp at Littlestone by Linolite, Ltd., in collaboration with Mr. J. Harcourt Coatts. An excellent effect is obtained by continuous runs of Linolite type "H" anodised aluminium reflector with Crompton striplight lamps. The ballroom floor is approximately 90 ft. by 45 ft., and with a loading of 7 kW the resultant average illumination of the working plane is 5¼ ft. candles.



The ballroom at a holiday camp at Littlestone lighted by Crompton striplight lamps in Linolite reflectors

G.W.R. Contract

The Great Western Railway Co. has recently placed with the British Thomson-Houston Co., Ltd., an important order for converting equipment to augment the supply to the electric line between Paddington and Hammersmith. The order comprises five 1,500-kW air-cooled steel tank rectifiers with tuned smoothing circuits, associated AC and DC switchgear and twelve track feeder equipments. The rectifiers will be installed in two existing substations where they

Electrical displays at the Royal Lancashire Agricultural Show

will replace some very old motor convertors. They will operate at six-phase with transformer primary windings alternately star and delta connected and taking a supply at 6,600 V, three-phase, 50 cycles from the London Power Co.

A School Electric Kitchen

Considerable interest has been taken in the provision of an all-electric kitchen at the new open-air school built at Black-a-Moor by Blackburn Education Authority. It is one of the first in the area to be so equipped, and includes refrigeration equipment by Moffats, Ltd., electric cooking equipment by the General Electric Co., Ltd., and an electric porringer by Burco, Ltd. Blackburn Corporation Electricity Department carried out the electrical installation.

Faraday House Old Students

Mr. L. Van Vestraut, hon. secretary of Faraday House Old Students' Association, informs us that in view of an important function which is being held on October 27th, the jubilee dinner of the Association will now be held on October 20th, a week earlier than the date originally fixed.

Overseas Electrical Trade

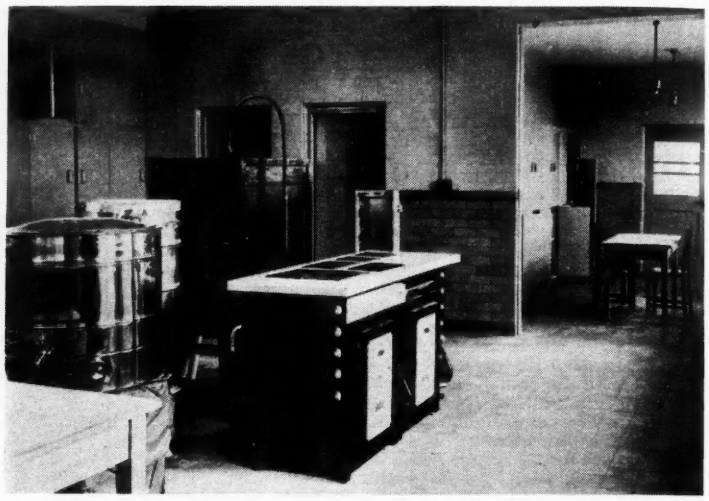
During July exports of electrical machinery and apparatus amounted in value to £1,581,973 —£215,838 less than in the corresponding month last year. Most of the decline is accounted for in the electrical machinery section, the total exports there falling from £679,799 to £519,340. Imports also show a decrease, from £338,054 to £295,647.

A Coming of Age

Metal Manufacturers, Ltd., of Port Kembla, Australia, which produces non-ferrous wire, tubes and cable, celebrates its "coming of age" this year, and the June issue of its journal, "M.M. Gazette," commemorates the occasion with a series of interesting articles showing the progress made by the company since its inception.

A Modern Hotel Lighting Installation

Acting on the principle that the ideal modern lighting system should be prepared as an integral part of the main architectural scheme, Bradbury & Evans made an intensive study of hotel lighting before deciding on the illumination to be installed in the New Clarence Hotel, Dublin. As a result of this study of different types and classes of lighting fittings, it was decided to install Holophane lighting, and after a visit to London, where inspections of different units and trials were held, a scheme of lighting was designed in collaboration with Holophane lighting experts, "built-in" lighting has been used for a number of public rooms at the hotel. The optical equipment of these fittings is designed to give a maximum downward concentration of light by means of the prismatic construction of lens plate and reflector. For dealing with the restaurant, eight single-light close ceiling fittings, incorporating No. 760 dished lens plate, are installed, these being supplemented by two semi-recessed type fittings utilising a similar lens equipment. For the service, back hall, Essex Street entrance and landing, corridors and other subsidiary positions, close ceiling type "Steplite" glassware is employed. A short suspension fitting of special design, incorporating "Steplite" glassware and an etched glass halo has been used in the bar and upper hall. With regard to the lounge, which is octagonal in shape, it was deemed advisable to design a fitting which would conform with this architecture. Consequently, an eight-panel "Pagoda" fitting incorporating a "Steplite" glassware in the bottom was advocated for the central position in this room, this being supplemented by four single-light semi-recessed dished lens plate fittings in the lounge itself, whilst the four alcoves around the sides were adequately dealt with by means of concentrating type prismatic lens fittings. For the dining room and sitting room, large drum type close ceiling fittings incorporating "Steplite" glassware have been installed. The electrical contractors were McGuire & Gatchell.



A corner of the electric kitchen at a Blackburn open-air school

Holophane lighting in the lounge of the Clarence Hotel, Dublin

Prices of Materials

The following prices are only general, and they may vary according to quantities and other circumstances:—

CHEMICALS, ETC.	Price August 16th	Fortnight's inc. or dec.
a Acid oxalic ... ... per cwt.	50s.	—
a Ammoniac, Sal ... ... per ton	£37	—
a Ammonia, Muriate (large crystal) ... ,,	£18 10s.	—
a Borax ... ... ,,	£17	—
a Copper, Sulphate ... ... ,,	£19	—
a Potash Chlorate ... ... per lb.	3¾d. to 4¾d.	—
a ,, Perchlorate... ... ... ,,	6d.	—
a Shellac ... ... per cwt.	£4 8s.	—
a Sulphur, Commercial ... ... per ton	£11	—
a ,, Roll ... ... ,,	£11	—
a Soda, Chlorate ... ... per lb.	3½d. to 3¾d.	—
a ,, Crystals ... ... per ton	£5 to £5 5s.	—
a Sodium, Bichromate, casks ... per lb.	4¼d. net.	—
METALS, ETC.		
b Aluminium, Ingots ... ... per ton	£94	—
b ,, Wire ... ... per lb.	1/1 to 1/9	—
b ,, Sheet and Foil ... ... ,,	1/2½ to 2/9	—
p Babbits Metal and Anti-friction Metals—		
Grade I ... ... per ton net	£197	—
Grade II ... ... ,,	£137	—
Grade III ... ... ,,	£73	—
c Brass (rolled metal 2" to 12" basis)... per lb.	8¾d.	½d. inc.
c ,, Tubes (solid drawn) ... ... ,,	11¾d. to 1s.	½d. inc.
c ,, Wire, basis ... ... ,,	8¾d.	—
c Copper Tubes (solid drawn) ... ... ,,	1/0¾d.	—
g ,, Bars (best selected) ... per ton	£80	—
g ,, Sheet... ... ... ,,		
g ,, Rod ... ... ,,		
d ,, (Electrolytic) Bars ... ... ,,	£50 10s.	15s. inc.
d ,, ,, Wire Rods ... ,,	£55	15s. inc.
d ,, ,, H.C. Wire ... per lb.	8d.	—
f Ebonite Rod ½" dia. & up ... ... ,,	1/10 to 2/3	—
f ,, Sheet ⅛" thick & up ... ... ,,	1/4 to 1/8	—
n German Silver Wire, Nos. 1 to 12 ... ,,	2/4	—
h Gutta-percha, fine ... ... ,,	Nom.	—
h India-rubber, Para-fine ... ... ,,	7¾d.	½d. inc.
i Iron, Pig (Cleveland, No. 3) ... per ton	£4 15s.	—
i ,, Wire galv. No. 1 P.O. Qual.... ,,	£23	—
g Lead, English Pig ... ... ,,	£16 15s.	10s. dec.
g Mercury ... ... per bot.	£16 10s.	—
e Mica (in original cases) small ... per lb.	1/– to 2/6	—
e ,, ,, ,, medium ... ,,	7/6 to 15/–	—
e ,, ,, ,, large ... ,,	17/6 to 22/6 up	—
p Phosphor Bronze, plain castings ... ,,	1/2½	—
p ,, ,, drawn bars & rods ,,	1/1½	½d. inc.
p ,, ,, rolled strip & sheet ,,	11¾d.	½d. inc.
p ,, ,, wire ... ... ,,	1/1⅝	⅝d. inc.
o Platinum ... ... per oz.	£7 10s.	—
d Silicium Bronze Wire ... ... per lb.	8¾d.	—
g Spelter ... ... per ton	£14 10s.	1s. 3d. dec.
g Tin, Block (English) ... ... ,,	£230	—
n ,, Wire, Nos. 1 to 16 ... ... per lb.	3/9	—

Quotations supplied by:—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India Rubber, Gutta Percha and Telegraph Works Co., Ltd.
g Henry Gardner & Co., Ltd.
h Edward Till & Co.
i Bolling & Lowe.
n P. Ormiston & Sons
o Johnson Matthey & Co.
p C. Clifford & Sons, Ltd.

The above table is published here fortnightly. In alternate issues, in which it does not appear, the latest prices of copper, silicium bronze wire, lead, rubber, tin and spelter, up to the time of going to press, are given in this section under the same heading.

New Catalogues and Lists

Power Equipment Co., Ltd., Kingsbury Works, The Hyde, Hendon, London, N.W.9.—A pamphlet describing totally enclosed iron-clad type "EO" industrial circuit-breakers.

General Radiological, Ltd., 15-18, Clipstone Street, Great Portland Street, London, W.1.—Booklets illustrating and describing the Siemens Roentgen bomb, the "Fluoroscope" camera unit, the "Ergoscope" and "Isotherm" short-wave therapy equipment.

English Electric Co., Ltd., Preston.—A catalogue of domestic appliances.

British Insulated Cables, Ltd., Prescot, Lancs.—Complete catalogues of service cut-outs with non-conductive cases and feeder and distribution pillars and panels.

Harcourts, Ltd., 1, Kean Street, London, W.C.2.—A catalogue of "Harcoray" reflectors.

L. G. Hawkins & Co., Ltd., 30-35, Drury Lane, London, W.C.2.—A leaflet relating to an adjustable emergency lighting torch.

Trade Announcements

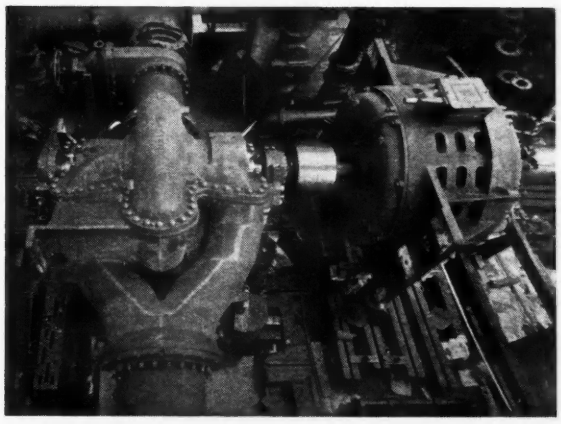
The telephone numbers of Switchgear & Cowans, Ltd., have been changed to Trafford Park 2881-5.

Pumping Methods

While conditions in Great Britain have not hitherto justified the installation of electrically driven pumps as large as those in common use in the United States (where, as mentioned by Mr. F. Johnstone Taylor in our issue of May 19th, units exceeding 1,000 HP are quite common), nevertheless many of much greater output have been manufactured in this country for use abroad. Mather & Platt inform us that they have built a large number with outputs in excess of 1,000 HP during the past forty years (the largest of over 3,000 HP), while as long ago as 1906 they supplied a waterworks pump driven by a 1,800-HP motor.

Among other electrically driven units of 1,000 HP and over built by them for India are those at Bangalore, Pultah and Tallah. For Great Britain general conditions are more nearly represented by the plant provided by the same company for the Slitting Mill pumping station of the South Staffordshire Co. and the Blundell House station of the Southport Water Board.

Our picture, which was taken on the test bed at Mather & Platt's works, shows a 36 in./44 in. verticle spindle "Mediyane" pump capable of handling 34,722 GPM, 140-ft. total head, operating at a speed of 500 RPM synchronous. The motor, also of Mather & Platt manufacture, is rated at 1,465 BHP, and is of the drip-proof, slip-ring type designed for a three-phase, 50-cycle, 2,000-V supply. This pump has been supplied to South Africa to the order of Rand Water Board.



Mather and Platt pump on test bed before being dispatched to the Rand Water Board

Information Department

GENERAL inquiries from readers relating to sources of electrical goods, makers' addresses, &c., are replied to by our Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Our extensive records enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the following:—

DAKOS table lamp.
STANDARD refrigerator.
BELL electric pump.

Municipal Supply Undertakings' Results

Town	Engineer	Total Revenue 1937/8	Total Revenue 1938/9	Working Expenses 1937/8	Working Expenses 1938/9	Net Profit or Loss 1937/8	Net Profit or Loss 1938/9	Sales of Electricity 1937/8	Sales of Electricity 1938/9	Percentage Increase
		£	£	£	£	£	£	Thousands of kWh.		
Barnstaple	E. A. Barker	26,834	31,963	16,460	17,548	138*	2,412	2,538	3,500	37.9
Bath	J. W. Spark	198,869	228,463	157,175	179,805	7,807	8,523	58,346	66,311	13.7
Belfast	F. H. Whysall	704,242	720,756	352,441	359,592	86,675	66,971	178,635	193,499	8.3
Birmingham	F. Forrest	3,040,518	3,199,787	2,192,819	2,293,285	192,538	298,798	778,084	815,483	4.8
Blackburn	R. H. Harral	249,999	260,287	129,011	148,489	29,747	13,720	52,879	56,005	5.9
Bolton	H. E. Annett	408,267	434,441	307,469	332,829	40,069	43,739	103,500	105,578	2.1
Brighton	W. N. C. Clinch	550,056	555,152	412,657	394,376	12,769	29,092	112,956	125,037	10.7
Bristol	A. J. Newman	1,103,926	1,208,835	788,488	856,604	34,665	52,126	266,120	300,313	12.8
Bromley	W. G. Trend	124,153	134,639	84,409	95,630	8,286	4,053	18,017	20,339	12.9
Burnley	J. E. Starkie	129,700	142,990	96,523	104,187	4,383	4,612	23,850	28,324	18.8
Burton-on-Trent	T. Hall	212,593	226,962	142,367	150,764	16,162	17,435	46,134	49,981	8.4
Cannock	P. Wardle	69,117	77,116	46,102	54,050	5,644	5,445	13,196	15,486	17.3
Carlisle	C. W. Salt	147,051	158,718	104,132	110,628	6,622	5,947	28,154	30,209	7.3
Clacton-on-Sea	G. Broadhurst	59,678	65,614	29,434	39,659	2,459	2,076	6,444	7,598	17.9
Cleethorpes	B. S. Lord	36,677	38,659	24,778	27,180	1,028	779*	5,246	6,691	32.7
Colchester	G. P. Dixon	169,760	184,713	107,359	123,233	1,257	6,067*	23,639	26,260	11.1
Coventry	W. J. Marston	681,936	727,337	472,480	500,290	57,448	18,417	214,100	223,700	4.5
Darwen	F. M. Fletcher	47,436	47,134	30,787	32,466	7,129	4,909	7,334	7,520	2.5
Dover	R. G. Widgery	70,371	76,061	46,956	55,078	5,116	3,391	6,900	8,067	16.9
East Ham	W. R. Elliott	207,237	225,366	142,381	162,798	5,624	4,993	29,848	34,037	14.3
Eastbourne	N. Boydell	232,142	242,014	172,508	184,852	5,330	3,175	36,831	38,315	4.0
Gainsborough	E. Breckell	29,657	36,492	20,809	26,965	1,943	2,785	5,611	6,145	9.5
Guernsey	F. Barritt Hills	50,545	58,534	27,398	30,400	9,407	2,487	6,000	6,700	11.6
Guildford	W. E. Affleck	139,976	154,521	85,606	106,829	5,913	1,791*	30,681	35,917	17.0
Hampstead	H. Brierley	219,203	228,047	192,069	218,223	27,237	9,066	44,818	46,982	4.8
Hastings	A. J. Ryan	242,273	270,549	157,623	196,958	21,973	4,543	46,587	53,367	14.5
Ilford	G. F. Gregory	358,934	389,231	296,439	339,223	11,066*	32,999*	62,498	74,995	20.0
Ipswich	H. E. Blackiston†	283,305	313,706	202,040	228,489	33,249	31,384	57,945	62,021	7.0
Kettering	W. A. Walker	243,659	289,247	184,397	228,555	5,203	1,682	69,900	83,592	19.6
Lancaster	G. C. Milnes	178,441	202,340	121,635	142,340	20,833	21,015	40,543	48,836	20.9
Leeds	F. Nicholls	1,099,089	1,116,253	544,853	599,190	90,491	38,842	254,989	261,483	2.5
Leicester	J. Mould	744,955	777,699	490,031	523,148	74,774	30,642	147,351	154,086	4.6
Leigh	J. B. Hudson	83,562	81,851	56,575	61,599	12,761	6,066	18,963	18,086	4.6 decrease
Lincoln	F. Newey	139,696	147,829	100,831	101,651	6,203	10,015	32,392	32,535	0.6
Liverpool	P. J. Robinson	2,090,207	2,243,714	1,416,583	1,158,425	224,319	100,833	473,258	511,178	8.0
Loughborough	J. P. Tucker	74,271	75,962	58,398	60,545	373	253	15,015	15,519	3.4
Maidstone	E. E. Hoadley	167,962	185,205	105,001	116,199	2,902	10,717	38,711	41,601	7.5
Manchester	H. C. Lamb	2,177,726	2,221,473	1,702,518	1,726,949	79,576	75,245	474,631	478,957	0.9
Newport	A. Nichols Moore	294,652	285,480	211 543	203,034	8,481	4,063	68,063	59,536	12.5 decrease
Nottingham	G. H. Lake	812,917	851,753	480,814	524,000	47,362	40,130	143,901	161,365	12.1
Oldham	F. L. Ogden	356,173	352,248	189,759	202,384	21,160	12,314	82,481	81,381	13.7
Oxford	H. G. Fraser	235,531	257,269	175,079	201,009	18,226	15,595	31,948	35,681	11.5
Plymouth	H. Midgley	283,794	339,924	201,920	227,681	33,595	27,288	49,168	55,059	12.0
Preston	G. A. Robertson	527,755	527,133	359,560	375,456	27,846	5,242	69,756	71,294	2.4
Rawtenstall	J. E. Shepherd	99,233	108,058	74,466	82,135	2,846	4,074	21,179	22,597	6.7
Sheffield	J. R. Struthers	1,431,445	1,497,360	868,794	920,164	239,020	139,746	542,482	552,068	2.0
St. Marylebone	C. H. Smyth	777,668	866,085	598,197	650,229	27,116*	1,439*	208,184	210,412	1.1
St. Pancras	R. Lee	442,114	460,959	309,204	333,381	24,241	19,274	78,672	82,381	4.7
Salford	L. Romero	464,439	459,068	320,737	326,058	36,550	39,721	111,818	110,977	0.7 decrease
Stalybridge	J. H. Lumsden	227,182	241,682	73,523	61,336	32,038	29,211	69,066	71,390	3.2
Stoke-on-Trent	C. H. Yeaman	440,126	476,589	288,914	349,696	45,324	5,308	111,574	120,672	8.0
Stretford	T. A. Kerr	474,077	500,369	357,379	380,437	25,530	22,541	177,017	173,767	1.9 decrease
Sunderland	W. A. Royle	246,719	252,282	154,924	185,202	38,205	33,970	68,743	67,376	2.0 decrease
Tunbridge Wells	R. N. Torpy	149,105	165,003	103,880	124,081	8,619	2,971	37,022	42,880	15.8
Walsall	E. A. Newburn	230,108	248,370	157,248	174,257	34,585	35,812	47,647	52,325	9.8
West Ham	J. W. J. Townley	646,211	691,337	448,703	502,800	73,471	62,882	155,100	163,923	5.7
Weymouth	G. Nicolson	77,722	83,106	51,087	61,148	7,870	2,408	14,121	15,909	12.7

* Loss. † Since appointed borough electrical engineer at Swansea.

ELECTRICITY SUPPLY

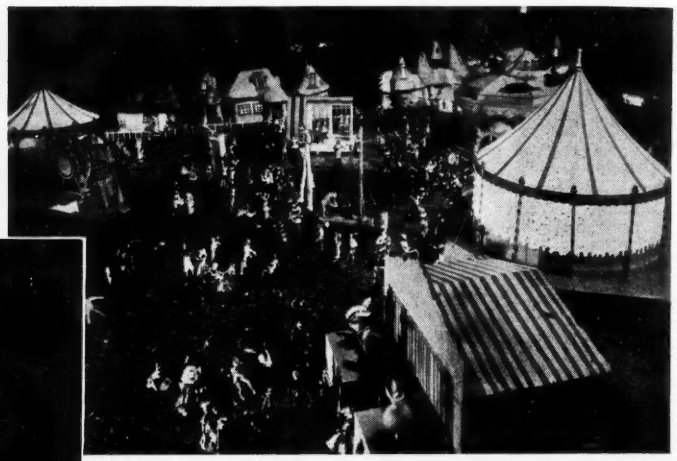
Illuminations at Blackpool and Southend. Three Sources of Bulk Supply for Inverness. I.O.M. Board's Proposal to Establish a Generating Station

Barnoldswick.—OVERHEAD LINE.—The Yorkshire Electric Power Co. is to erect an overhead line from Silsden to Barnoldswick.

Billingham-on-Tees.—PROPOSED COUNCIL HOUSE INSTALLATIONS.—The Urban District Council is to ask the North-Eastern Electric Supply Co., Ltd., to state terms for installing electricity in houses on the Clarence Road estate.

Blackpool.—PREPARING FOR THE ILLUMINATIONS.—Over 120 men have been engaged on preparing the illumination scheme which starts on September 15th. The five-mile display will comprise nearly 27 miles of strip lighting. 1,000 tons of material are being used in a display costing £20,000, and the work has been carried out under the illuminations director, Mr. F. W. Field.

Bognor.—SUB-STATIONS.—We are informed by Mr. W. W. Hammond, engineer and manager, Bognor Gas and Electricity Co., that a new sub-station at Snooks Corner, Felpham, has been fitted with a fully automatic 500-kV transformer to serve the new 200-HP pumps installed by the Council for a new system of sewage and drainage. Another new sub-station, at Pagham Beach, has been equipped with a 250-kVA transformer, to serve the 200 bungalows erected on the beach. A feature of this scheme is that underground cables had to be laid in sand and shingle. The consumers there pay a fixed charge of 32s. per year with a running charge of ¾d. per kWh, the slot meter being set at 1d. per kWh.



"Fluorescent Garden" and "Pygmy Fair" at Southend-on-Sea **(see note on page 239)**

Bolsover.—BETTER LIGHTING.—Improvements to the street lighting estimated to cost £852 are to be carried out by the Urban District Council.

Bolton.—STREET LIGHTING IMPROVEMENTS.—Work has begun on installing new sodium vapour lamps in various thoroughfares. When completed, Chorley New Road and Chorley Old Road will be linked up by the modern style of street lighting, with Derby Street and Deane Road. Mercury-vapour lamps in St. George's Road, and sodium-vapour lamps in the town, (excepting Bury Road and Manchester Road) will be centrally controlled from the new headquarters of the Lighting Department.

Bristol.—OVERHEAD LINE.—The Town Council proposes to erect overhead lines to Conham Hill and Lower Cock Road.

Cannock.—BULK SUPPLY.—The Urban District Council proposes to take a bulk supply of electricity from the West Midlands Joint Electricity Authority.

Canterbury.—BETTER LIGHTING.—The City Council has approved a scheme for the provision of forty street lamps during the next two years for lighting improvements in Military Road, Union Street, Guildhall Street, Palace Street, The Borough, Northgate, and Sturry Road. The estimated cost is £824.

Colchester.—SUPPLY TO ARMY CAMP.—The Electricity Committee is to provide a supply at a cost of £766 to an army camp at Blackheath.

Douglas (I.o.M.).—SWITCH-HOUSES.—The Electricity Committee has approved plans for the erection of switch houses at the North Quay and Pulrose power station.

Eccles.—SUPPLY FOR SWING BRIDGE.—Arrangements have been made by the Electricity Committee to provide a supply, at a cost of £656, to the Manchester Ship Canal Co., in connection with the proposed electrification of the mechanism controlling the Barton swing bridge and locks.

Elland.—MERCURY LIGHTING.—The Urban District Council is to proceed immediately with a scheme for mercury lighting in the Ainleys. Application is being made for permission to borrow £500 to cover the cost of the scheme.

Gateshead.—MAIN ROAD LIGHTING.—Both the Newcastle and Gateshead Gas Co. and the North-Eastern Electric Supply Co., Ltd., are to submit estimates to the Town Council for the lighting of the main roads in the area.

EXTENSIONS.—Plans have been approved for cables in Beechwood Gardens, Ravensworth, for the North-Eastern Electric Supply Co., Ltd.

Glasgow.—MAINS EXTENSIONS.—The Electricity Committee is to extend the mains at a cost of £19,500.

Hastings.—DISTRIBUTION IMPROVEMENTS.—Sanction is being sought by the Town Council to a loan of £30,690 for carrying out improvements to the distribution system.

Inverness.—THREE BULK SUPPLY POINTS.—It is understood it has now been decided that the partial bulk supply from the Grampian Electricity Supply Co. to Inverness Corporation will be taken from three different sources, which will practically eliminate the possibility of breakdown. The necessary transformer plant will be installed at the burgh electricity works at Waterloo Place. As power will be taken during the winter temporary plant will be installed immediately.

Isle of Man.—ELECTRICITY BOARD APPLIES FOR OWN GENERATING PLANT.—The Isle of Man Government has notified the Douglas Corporation of an application by the Isle of Man Electricity Board to set up a separate generating station instead of purchasing bulk supply from the Corporation and states that in a very small place like the Isle of Man it would seem very undesirable to have to duplicate plant. On the other hand, it adds, if it can be shown that by the installation of a separate generating system the Isle of Man Electricity Board can produce energy at a lower rate than by purchasing it from the Corporation, there might be some justification for permitting such duplication.

The application by the Board to the Government mentions that the Board has obtained prices for the construction of a generating station and the estimated cost per kWh generated, and these figures have been checked against the results obtained in the islands of Jersey and Guernsey where the electricity undertakings are owned by the State and operated in districts similar to the Isle of Man. In both cases electricity is generated in Diesel engine stations. The British Broadcasting Corporation has its own private generating station at Droitwich and this station is of the same plant capacity and powered by similar sized Diesel units as at the station proposed by the Electricity Board. The generating costs of these stations are: Jersey 0.47d., Guernsey 0.458d. and Droitwich 0.46d., giving an average of 0.462d. per kWh. The Board estimates that it will be able to generate at 0.66d. per kWh. which shows a saving of 0.17d. per kWh on the price paid to the Douglas Corporation. There would be a saving to the Board on six million kWh of £4.250 at the present tariff. The Board is satisfied that it would not be economically possible to obtain all the electrical energy that is now required from the Sulby River and it is, therefore, proposed in the first instance to install 2,000 kW of Diesel generating plant to meet the immediate requirements. Replying to these points, the

Douglas Corporation Electricity Committee agrees that two generating systems would be undesirable and expresses the opinion that before any decision is arrived at the Government should obtain an independent opinion on the subject from some competent and impartial body.

Johnstone.—ELECTRIC STREET LIGHTING PLANS.—We are informed that the British Thomson-Houston Co., Ltd., has secured the contract for lamps and equipment for a comprehensive installation of street lighting at Johnstone, which includes the main routes through the town, the lighting of Houston Square and the bandstand. The equipment comprises 140-W "Sodra" lamps in "H" lanterns, with control gear. For the bandstand and square, a blended light system employing both "Mazda" and "Mercra" lamps will be installed. Special provision is being made at the main intersections for A.R.P. facilities, in accordance with the requirements of the Civil Defence Bill. At these points illumination will be provided in an emergency by means of "Mercra" ultra-violet lamps and fluorescent paints. The installation has been designed by Mr. J. Orr, consulting engineer to the Town Council.

Keighley.—MAINS.—The Electricity Committee is seeking sanction to borrow £30,000 for mains and services.

AIR RAID PRECAUTIONS.—An expenditure of £3,132 on A.R.P. has been approved by the Town Council.

Lichfield.—PLACING LINES UNDERGROUND.—The Electricity Committee has prepared an estimate of £3,584 for placing overhead lines underground in connection with a proposal of the Air Ministry to establish an R.A.F. station at Fradley.

EXTENSIONS.—Arrangements have been made with the Staffordshire County Council to provide a supply at a cost of £125 to four farms at Whitemere small holdings, and with the Lichfield Rural District Council for mains extensions at a cost of £180 to Packington Hall.

The Electricity Committee reports that the West Midlands Joint Electricity Authority has approved the Council's application for a Fringe Order to supply 71 additional premises in the parish of Yoxall.

Newcastle (Staffs).—MERCURY-VAPOUR LAMPS.—The Corporation is to erect mercury-vapour lamps along Etruria Road, Basford, and to improve the lighting at Black Bank.

Sheffield.—SUB-STATIONS.—The Electrical Distribution of Yorkshire, Ltd., is to erect three sub-stations on the Parson Cross estate extension.

Shipley.—LOAN.—The Electricity Committee is seeking sanction to borrow £3,000 for appliances and £1,000 for wiring.

Sleaford.—BAKING TARIFF.—The Electricity Committee has fixed an off-peak tariff for electric baking ovens at ¾d. per kWh plus a hire charge for the time switch.

Southend-on-Sea.—FESTIVAL OF LIGHT.—On July 29th the first section of this season's illuminations ("Never Never Land") was switched on and the remainder of the scheme on the cliffs and promenades will be brought into public view tomorrow. The application of fluorescent powders and black lamps is again playing a big part in the scheme, particularly in "Never Never Land," where some ten new displays are being arranged. This year a feature introducing only fluorescent powders for its lighting is being placed on the foreshore. Among the new set-pieces for this year's Festival of Light are the following: "Carnival in Fairyland," "Pan and the Wood Nymphs," "Fluorescent Gardens," "Fluorescent Caves," "Fluorescent Tropical Island," "Pygmy Fair," "Insects Car Breakdown," etc., and many other smaller features designed principally for the children. Mr. A. C. Johnson, the borough electrical engineer and manager, states that the value of the illuminations on view this year is estimated at £25,000.

Thornaby-on-Tees.—ELECTRICITY FOR HOUSES.—The Town Council proposes to install electricity in about 370 houses at a cost of £5 per house.

TRACTION

France.—PARIS "UNDERGROUND" PROGRESS.—At the recent annual meeting of the Compagnie du Chemin de Fer Metropolitain de Paris it was stated that the length of the urban system of the Paris underground electric railways remains at approximately 91 miles, no extensions having been completed during 1938. In addition, there are about 8½ miles of outer-Paris lines. During the year two local sections of the Paris-Luxemburg railway were taken over by the Metro Co., whose system now extends altogether to 111¼ miles. Although the number of transforming stations supplying power to the Metro lines remains at 29, their capacity was increased during the year from 178,000 to about 184,000 kW. Three new sub-stations are to be constructed during the present year.

Ipswich.—TRANSPORT UNDERTAKING RESULTS.—Mr. H. E. Blackiston, who was chief engineer and manager of the transport undertaking for the year 1938-39, reports an increase of £8,324 (8 per cent.) in the total income, which amounted to £111,478. The actual number of passengers carried rose by nearly a million to 19 million, with an increase in the average fare paid from 1.343d. to 1.376d. There was an increase in the working expenses of £5,717; of this £1,350 is due to increased wages and £740 to the increase of 0.1d. per kWh in the charge for electricity. The financial position of the undertaking is, however, still giving some concern, although there was a profit of £265 compared with the previous year's loss of £2,342, as again no provision is made for renewals and the deficit of £2,000 carried forward is not likely to be liquidated during the present year owing to the rise in the cost of operation.

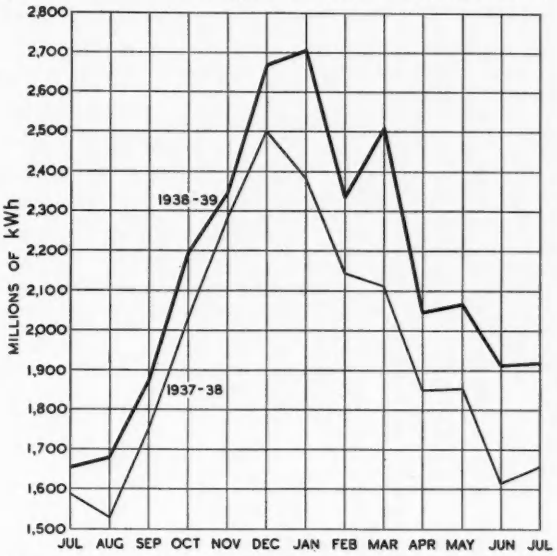
COMMUNICATIONS

China.—CHUNGKING-HONG KONG RADIO-TELEPHONE LINK.—*Reuter* reports that Chungking, the provisional headquarters of the Chinese Government, was to be linked with Hong Kong by radio telephone as from last Tuesday. Arrangements are also nearing completion for direct radio telephone services to Rangoon and Manila, the capitals of Burma and the Philippine Islands respectively.

Holland.—OVERSEAS TELEPHONE COMMUNICATION SERVICE.—Somewhat akin to the cheap overseas telegraphic service which has recently been brought into existence in this country, the Dutch telephone authorities have, according to the *Europaischer Fernsprechdienst*, recently introduced as an experiment a scheme whereby people in Holland may speak over the telephone to members of their family in Java and other parts of the Dutch East Indies at a specially cheap rate.

Generation of Electricity in July

OFFICIAL returns rendered to the Electricity Commissioners show that 1,918 million kWh was generated by authorised undertakings in Great Britain during July, as compared with the revised figure of 1,656 million kWh in the corresponding month of 1938, representing an increase of 262 million kWh, or 15.8 per cent. The number of working days in the month (*i.e.*, excluding Sundays) was 26, the same as last year.



Curves comparing the trend of electricity generation during the past two years

During the seven months of 1939 up to the end of July, the total amount of electricity generated by authorised undertakings was 15,488 million kWh, as compared with the revised figure of 13,609 million kWh for the corresponding period of 1938, representing an increase of 1,879 million kWh, or 13.8 per cent.

Loan Sanctions Issued

DURING the four weeks ended August 12th the Electricity Commissioners sanctioned the borrowing by public authorities (joint electricity authorities, joint electricity boards and local authorities) for electricity supply purposes of a total sum of £2,077,145, made up as follows.—Purchase of property, £8,699; generating station buildings, £254,239; buildings for distribution purposes, £46,359; generating station plant, £892,534; distribution plant, £216,041; mains extensions, house services, meters and instruments, £523,122; and consumers' wiring installations, consumers' electrical apparatus, &c., £136,151.

The total includes the following individual sanctions for amounts of £250,000 or more:—£600,000 for plant and building extensions at the Roath generating station of the Cardiff Corporation, and £300,000 for plant and building extensions at the Townmead Road generating station of the Fulham Metropolitan Borough Council.

The total amount sanctioned during the period April 1st to August 12th was £8,964,519, which compares with £7,717,904 in the corresponding period of last year.

FINANCIAL SECTION

New Companies. Returns of Capital. Debenture Charges. Bankruptcies and Liquidations. Reports of Electrical Companies. Dividend Announcements. Stocks and Shares

New Companies Registered

Radiovision Rentals, Ltd. — Private company. Registered August 12th. Capital, £1,000. Objects: To carry on the business of wholesale and retail dealers in and hirers of television and wireless apparatus, &c. Directors: A. F. Newling, 7, Ingrebourne Gardens, Upminster; and J. D. Shearmur, 14, The Broadway, Snakes Lane, Woodford Green. Registered office: 14, The Broadway, Snakes Lane, Woodford Green, Essex.

Samuel Reed & Sons, Ltd.—Private company. Registered August 11th. Capital, £1,500. Objects: To carry on the business of electricians, electrical, mechanical, automobile and constructional engineers, &c. Permanent directors: S. Reed (chairman and managing director), 193, Maidstone Road, Sidcup, Kent; E. J. Reed, 17, Midfield Way, St. Paul's Cray, Kent; and W. H. Smith, 212, Perry Hill, Catford, S.E.6. Secretary: E. J. Reed. Registered office: 58, Great Dover Street, S.E.1.

Forte Lamps, Ltd.—Private company. Registered August 11th. Capital, £1,000. Objects: To carry on the business of manufacturers of and dealers in electric lamps and fittings, quartz lamps, reflectors, bells, fires, stoves, &c. N. C. Ashby, 549, Seaside, Eastbourne, is permanent director and chairman. Secretary: M. A. Christian. Registered office: Fort Road, Seaside, Eastbourne.

Freddies (Auto Electricians), Ltd.—Private company. Registered August 10th. Capital, £100. Objects: To carry on the business of dealers in wireless, electrical and radio appliances, accessories and supplies, particularly as used in motor vehicles, &c. Directors: F. W. Edmondson, 329, Briercliffe Road, Burnley; and E. Moulds, "Linton," Herkomer Avenue, Burnley. Registered office: 11, Nicholas Street, Burnley.

Ashton, Reynolds, Purvis Supplies, Ltd. — Private company. Registered August 3rd. Capital, £100. Objects: To carry on the business of manufacturers, sellers and distributors of lampshades, fire-fighting appliances, portable and permanent shelters of all kinds, &c. Directors: W. E. Ashton (permanent), Ashley Bank, South View Road. Pinner, Middx.; and E. V. Weller, 20, West Hill Road, Wandsworth, S.W.18. Registered office: 9, North Street, Leatherhead, Surrey.

Dalton Engineering, Ltd. — Private company. Registered July 24th. Capital, £100. Objects: To carry on the business of constructional, motor, marine, electrical and mechanical engineers, contractors and sub-contractors, carriers and transport contractors, &c. The permanent directors are: L. W. Dalton and L. E. Dalton, both of 60, Hillway, Highgate, N.6. Registered office: 5/7, D'Arblay Street, W.1.

Ainley (Leeds), Ltd.—Private company. Registered July 31st. Capital, £100. Objects: To carry on the business of electrical, lighting, heating, wireless, mechanical and general engineers, engineering contractors and factors, &c. Permanent directors: J. R. Ainley and Mrs. A. G. Ainley, both of 24, Montagu Crescent, Leeds, 8. Solicitors: Bulmer Lawson & Roberts, 26, Albion Street, Leeds.

Green Lane Electric (Northwood), Ltd.—Private company. Registered July 31st. Capital, £250. Objects: To carry on the business of electrical and mechanical engineers, manufacturers and workers of and dealers in electricity, motive power and light; wireless engineers, manufacturers and workers of and dealers in wireless sets, gramophones and records, radio-gramophones and component parts thereof, &c. F. E. Waldren, 28, Kenton Park Road, Kenton, Middlesex, is first and permanent director. Solicitor: Edgar H. Hiscocks, 43, Craven Park, Willesden, N.W.10.

Fox Chemical-Engineering Works, Ltd.—Private company. Registered August 2nd. Capital, £500. Objects: To carry on the business of manufacturers of and dealers in all kinds of machinery, apparatus and equipment for plating, polishing or grinding metallic or non-metallic substances and similar processes, and machinery, apparatus and equipment for the generation, supply, distribution and accumulation of electricity, &c. R. H. P. Fowler, 258, Ivydale Road, S.E.15, is the first director. Registered office: 14, Charterhouse Buildings, Goswell Road, E.C.1.

British Armour-clad Batteries, Ltd.—Private company. Registered August 10th. Capital, £2,500. Objects: To acquire the business of a manufacturer of electric storage batteries and other electrical equipment heretofore carried on by P. R. Phillips at Treforest Trading Estate, Glamorgan. P. R. Phillips, 25, Llantwit Road, Treforest, is permanent managing director.

Bristol Electrical Installations, Ltd.—Private company. Registered August 10th. Capital, £100. Objects: To carry on the business of electrical engineers and contractors, &c. Directors: R. St. C. Winter, 40, Plough Lane, Purley, Surrey; E. J. Evans, 23, Blenheim Street, Bristol, 5; L. W. W. Heape, 1, Balaclava Road, Fishponds, Bristol; and S. E. Paske, 37, Beechwood Road, Fishponds, Bristol. Registered office: 168, Stapleton Road, Bristol, 5.

Pictogram, Ltd.—Private company. Registered August 10th. Capital, £1,000. Objects: To carry on the business of advertising contractors, agent and designers, advertisers by lights and other mechanical and artificial means, electricians, manufacturers of and dealers in electrical illuminated and other advertisement signs, &c. Subscribers: J. S. P. Lake, B6, Warrington Court, Warrington Road, Croydon, and C. J. E. Edwards, 50, Heather Park Drive, Wembley. Solicitors; Underwood, Barron & Heys-Jones, 9, Cavendish Square, W.1.

Electric Clock Service, Ltd.—Private company. Registered August 10th. Capital, £1,000. Objects: To carry on the business of dealers in and hirers, cleaners, maintainers and repairers of clocks, watches, chronometers, timepieces, time recorders and instruments of all kinds for indicating, recording or registering the passage of time; electrical and scientific instruments and appliances, &c. Directors: S. Gold (permanent) and G. W. Johns, addresses not stated. Registered office: 117, Merton Road, Wimbledon, S.W.19.

Radiophones (London), Ltd.—Private company. Registered August 9th. Capital, £100. Objects: To carry on the business of manufacturers of and dealers in intercommunicating telephones, radio telephones, telephonic, telegraphic, television, wireless and electrical apparatus, &c. Directors: K. J. Garle, Bramley House, Bramley, nr. Guildford, and three others. Solicitor: H. E. Lloyd Garle, 1, Warwick Court, Grays Inn, W.C.1.

Camden Components, Ltd.—In recording the registration of this company in our issue of July 21st the name of Mr. H. A. Keeling, joint managing director, was given erroneously as H. A. King.

Companies' Returns

Statements of Capital

Lewes and District Electric Supply Co., Ltd.—Capital, £70,000 in £1 shares. Return dated May 26th. 69,000 shares taken up. £57,500 paid, £11,500 considered as paid. Mortgages and charges nil.

Wigtownshire Electricity Co., Ltd.—Capital, £175,000 in £1 shares. Return dated May 27th. 135,000 shares taken up. £135,000 paid. Mortgages and charges nil.

Contraflo Engineering Co., Ltd.—Capital, £43,725 in 53,000 shares of 16s. 6d. each. Return dated June 6th. All shares taken up. £43,725 considered as paid. Mortgages and charges nil.

J. Tee & Co., Ltd.—Capital, £500 in 10s. shares. Return dated April 6th. 603 shares taken up. £1 10s. paid on three shares, £300 considered as paid on 600 shares. Mortgages and charges: £1,000. dated April 6th, 1939.

Veritys, Ltd.—Capital, £196,000 in 720,000 units of stock of 5s. and 64,000 shares of 5s. Return dated April 4th. All stock taken up. £190,150 paid on 706,000 units of stock (including 6d. premium on 546,000 units). £3,500 considered as paid on 14,000 units. Mortgages and charges, nil.

Welwyn Garden City Electricity Supply Co., Ltd.—Capital, £150,000 in 100,000 7 per cent. cumulative preference shares of £1 and 1,000,000 ordinary shares of 1s. Return dated June 7th. 49,703 preference and 500,000 shares taken up. £74,703 paid (plus 6d. per share premium on 23,500 preference shares and 5s. per share premium on 300 preference shares). Mortgages and charges, £40,000. A return of allotments, made up to June 30th, 1939, shows a further 30,297 preference and 300,000 ordinary shares allotted for cash and fully called up.

Corlett Electrical Engineering Co. (1933), Ltd.—Capital, £2,500 in £1 shares. Return dated June 8th. 2,120 shares taken up. £1,620 paid. £500 considered as paid. Mortgages and charges, nil.

R. F. Winder, Ltd.—Capital, £12,000 in £1 shares. Return dated June 8th. 10,300 shares taken up. £10,300 paid. Mortgages and charges, £4,590.

Mortgages and Charges

Gilbert Gilkes and Gordon, Ltd.—Satisfaction to the extent of (a) £800 on February 3rd, 1931, and (b) £1,000 on September 30th, 1927, of debentures authorised October 11th, 1926, and registered December 3rd, 1926. (Notices filed August 5th, 1939.)

Brush Electrical Engineering Co., Ltd.—Debenture dated August 1st, 1939, to secure all moneys due or to become due from the company to Lloyds Bank, Ltd., not exceeding £100,000, charged on the company's assets, present and future, including uncalled capital, but excluding freehold and leasehold hereditaments and buildings and plant and machinery specifically charged by trust deed dated October 14th, 1938. (The charge created by the debenture is a first floating charge ranking in priority to floating charges securing 5½ per cent. prior lien debenture stock, 4½ per cent. redeemable debenture stock, and 4½ per cent. redeemable second debenture stock.)

Ashdowns, Ltd.—Satisfaction in full on July 29th, 1936, of mortgage dated July 26th, 1921, and registered July 29th, 1921. (Notice filed July 31st, 1939.) According to the register of mortgages the mortgage registered July 29th, 1921, originally secured all moneys due to bank.

Receiver Appointed

Cecil Newling, Ltd.—C. H. Appleby, F.C.A., of Aldwych House, W.C.2, was appointed receiver on July 31st, 1939, under powers contained in debenture dated April 6th, 1939.

Increases of Capital

Plymouth Rediffusion Service, Ltd.—The nominal capital has been increased by the addition of £25,000, in £1 ordinary shares, beyond the registered capital of £15,000. The 300,000 ordinary shares of 1s. in the original capital have been consolidated into 15,000 ordinary shares of £1.

W. H. Smith & Co. (Electrical Engineers), Ltd.—The nominal capital has been increased by the addition of £15,000.

in £1 ordinary shares, beyond the registered capital of £5,000.

Private Arrangements

J. Jackson, electrical engineer, &c., 114, Union Street, Oldham.—The creditors were called together on August 10th when the statement of affairs showed liabilities of £1,000. The net assets were £124, leaving a deficiency of £876. The debtor, it was stated, had been carrying on business for about 50 years and was fairly successful until the cotton slump in recent years. He attributed his present position mainly to that and also to losses incurred through a battery agency he acquired in 1925. It was decided that the debtor's accountant should realise the estate under a letter of authority, if possible sell the business as a going concern, and distribute the proceeds *pro rata* among the creditors in settlement of their claims.

Company Liquidations

F. W. Terry & Co. (Radio), Ltd., 25a, Hall Road, Peckham, S.E.—Particulars regarding the affairs of this company have been issued by the Official Receiver in the Companies Winding Up Department of the Board of Trade. The statement of affairs shows liabilities £1,031 and assets £733. The Official Receiver states that the company was formed in October, 1938, with a nominal capital of £500 to carry on business as manufacturers and dealers in wireless and television sets. The main part of the company's business consisted of selling radio receiving sets under hire-purchase agreements arranged through various finance companies. The company was handicapped by lack of working capital from its inception and appeared to have carried on with the assistance of a bank overdraft, and cash advances. The trading account from October, 1938, to April, 1939, showed a turnover of £1,554 and a gross profit of £628, but after taking into account the overhead expenses and losses written off there was a loss of £648. As a result of meetings of creditors and shareholders held in May last the Official Receiver remained liquidator of the company.

Radio Gram & Television, Ltd., 170, Bishopsgate, E.C.—The first meeting of creditors and shareholders under the compulsory liquidation of this company were held on August 2nd at the Board of Trade Offices, Carey Street, W.C. The Official Receiver reported that the company was formed in January, 1936, with a nominal capital of £120,000. The issued capital was £48,000. The company acted as buyers, sellers and dealers in gramophones, and manufacturers of gramophones, records, television sets and apparatus and other electrical and wireless components and apparatus. It was originally engaged in experimental work connected with a project to supply a broadcasting instrument combining a wireless set and gramophone to hotels and clubs. Considerable sums were expended in experimenting with various equipment, but it was apparently impossible to continue the company's business unless subscribers were allowed to use the gramophone for public purposes, dances and entertainment generally. Difficulty was experienced in obtaining licences and the failure of the company was attributed to action of the licensing authority in refusing to renew a bulk licensing agreement after the first year, which made it impossible for the company to continue its activities. Liabilities to unsecured creditors amounted to £12,629 while the assets were expected to realise only £25. The liquidation of the company was left in the hands of the Official Receiver.

Knudsen Television Syndicate, Ltd.—Meetings September 9th at 2, Austin Friars, London, E.C.2, to receive an account of the winding-up by the liquidator, Mr. M. J. Pelham.

Bankruptcy Proceedings

D. M. Hutchins, Malahat, 43, Alton Road, Parkstone, Dorset, and lately carrying on business as Ashley Radio, Ashley Cross, Parkstone, radio engineer.—The public examination was held on August 10th at the Law Courts, Stafford Road Bournemouth, when the statement of affairs disclosed ranking liabilities of £398 and a deficiency amounting to £358. The examination was concluded.

K. L. Forster, 18, St. James Avenue, Beckenham, Kent, lately carrying on business at 261, Kirkdale, Sydenham, S.E.26, under the style of Forster & Co., lampshade manufacturer. — The adjourned public examination was held at the County Court, Scarbrook Road, Croydon, recently. Debtor had filed a statement of affairs showing ranking liabilities of £911 and estimated assets of £43. It was alleged that in May, 1938, a traveller disappeared with cash and goods worth £160, and had not been traced, although the loss was reported to the police. Debtor attributed the failure to that loss, and decline in trade since the September crisis, when orders were cancelled. The examination was adjourned for closing.

W. T. Dalton, 62, East Street, Horsham, wireless engineer.—This debtor's public examination was held at the Court House, Church Street, Brighton, recently. The statement of affairs showed ranking liabilities of £866 and estimated assets of £523, leaving a deficiency of £343. Debtor attributed his present position to bad trade and costs of suing creditors. The examination was adjourned for closing.

B. Harris (Central Radio), wireless dealer, 96, Harwood Road, Fulham, and lately carrying on buisness at 144, Kingsland High Street, London, E.8.—Discharge suspended for one year and six months until January 13th, 1941.

H. V. Sore, electrical engineer, Electra House, Sun Street, Hitchin.—Last day for receiving proofs for dividend August 25th. Trustee, Mr. T. Pollitt, 6, The Parade, Northampton, Official Receiver.

Reports and Dividends

A. C. Cossor, Ltd.—At an extraordinary meeting held on August 10th a resolution was passed regularising the sale of the 1,000,000 ordinary 5s. shares in the company held by the vendor, A. C. Cossor (Holdings), a subsidiary of Sterling Industries (formerly Ismay Industries).

Mr. T. A. Macauley, a director and the new chairman, said that he had acquired the 1,000,000 shares. He had retained more than 200,000 of the shares, and Mr. N. S. Holland, his co-director in the Scottish Securities Corporation (of which Mr. Macauley is managing director) had taken 175,000. The balance had been placed with one of the largest insurance companies, Sir Harold Wernher, Charles Tennant & Son, and a number of other important people. Sir George C. Godfrey, the chairman, Mr. A. E. Somers (chairman and managing director of Sterling Industries), Mr. T. S. Cornwell and Mr. E. J. Strutt had resigned from the board of A. C. Cossor. After the meeting Mr. Macauley stated that he would be joined on the board by two or three others who had acquired substantial interests in the company. The remaining directors of A. C. Cossor, Mr. A. H. Johnson and Mr. J. H. Thomas (managing director), would continue in office.

Britannia Electric Lamp Works, Ltd.—Presiding at the annual meeting on August 14th, Mr. A. J. J. Fifer (chairman) said that with regard to the future it was gratifying to state that the company's principal business showed a healthy rate of expansion. The plant at Acton was now working at full capacity. The principal subsidiary plant at Wembley had been developed not only to meet present demands but also to take care of the increasing business now in prospect. In order to strengthen the position of the company, the board had deemed it prudent not only to make adequate provision for plant depreciation but also to write off £12,500 from the value of investments.

The Telephone Co. of Pernambuco reports a profit for 1938 of £4,065, as compared with £1,258 in the preceding year, reducing the deficit carried forward from £20,172 to £16,107. Owing to the unsatisfactory conditions with which the company has been confronted, particularly its inability to secure foreign exchange, it has been unable to meet the full interest rate on its obligations. The arrangement was still in force during the year whereby debenture holders had agreed to a temporary reduction in the interest rate on the 8 per cent. debentures to 4 per cent.; also, the creditors of the company agreed to continue the reduction in interest rate from 10 to 3 per cent. on the dollar demand loan. If the agreements for reduction of interest had not been in force there would have been a loss for 1938 of £5,813. The sinking fund provisions of the debenture trust deed continued to be inoperative.

The Folkestone Electricity Supply Co., Ltd., has declared an interim ordinary dividend of 4 per cent., tax free (same).

Waite & Son, Ltd., report a net profit for 1938-39 of £1,403, as compared with £5,299. The decrease is ascribed to the September crisis coming at the company's busiest time. It is proposed to pay a dividend of 2 per cent. (against 6 per cent.), and after placing £520 to tax reserve to carry forward £886 (against £1,019 brought in).

The Rangoon Electric Tramway and Supply Co., Ltd., is paying an ordinary interim dividend of 4 annas per share, free of Burman tax (against 6 annas).

W. Canning & Co., Ltd., are paying an interim dividend of 5 per cent., less tax (unchanged).

The South Metropolitan Electric Light & Power Co., Ltd., is maintaining its interim dividend at 3 per cent., less tax.

The Mid-Cheshire Electricity Supply Co., Ltd., is making an offer of 200,000 £1 ordinary shares at 30s. per share to shareholders. The additional capital is required to repay the bank overdraft arising out of the purchase of the majority holding of ordinary shares in the Mersey Power Co., and of other capital expenditure. The new shares will be entitled to an apportioned part of any dividend declared for the current year and will rank in all other respects with the existing ordinary shares.

Gabriel Wade & English, Ltd., report a profit for the year to May 31st of £88,392, an increase of £14,218 as compared with the previous year. The balance is struck after deducting £27,153 for income tax and N.D.C. The dividend for the year is maintained at 6 per cent., but the cash bonus is increased from 2 to 4 per cent., making a total distribution of 10 per cent. (against 8 per cent.). General reserve receives £30,000, and £51,916 is carried forward (against £42,874 brought in).

The Clyde Valley Electrical Power Co. is maintaining its interim ordinary dividend at 3 per cent., less tax. This year the capital ranking for distribution is £3,150,000.

TRADE MARK APPLICATIONS

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from August 9th:—

Breeze. No. 606233. Class 9 (IV). Electric generating, ignition and starting apparatus and parts thereof, all being parts of internal combustion engines, &c. —Breeze Corporation, Inc., Newark, New Jersey, U.S.A. (British representatives: Phillips and Leigh, 31-33, High Holborn, W.C.1.)

CHF (lettering and design). No. 604850. Class 9 (IV). Electric apparatus and instruments, signalling and measuring apparatus and instruments, radiographic apparatus and instruments for recording, reproducing and copying pictures, &c.—C. H. F. Muller Gesellschaft, Hamburg, Germany (British representatives: Dicker, Pollak, Mercer, Tench and Meyer, 21-23, Holborn, E.C.).

Vidor. No. 607719. Class 9 (IV). Cases for electric torches or electric pocket lamps.—Vidor, Ltd., West Street, Erith, Kent.

Playmate. No. 607933. Class 9 (IV). Radio receiving apparatus and parts thereof.—World Radio, Ltd., Trico House, Edgware Road, N.W.2.

Sky-Chief. No. 606106. Class 9 (IV). Radio apparatus.—Pionrad Trading Co., Ltd., King's Head Yard, Coptic Street, New Oxford Street, W.C.1.

Chanalyst. No. 607505. Class 9 (IV). Apparatus for testing the efficiency of radio receiving sets.—Holliday and Hemmerdinger, Ltd., 748, Hardman Street, Deansgate, Manchester.

Bio. No. 605210. Class 11 (IV). Electric cooking stoves, ventilating fans, hair dryers, heating and warming apparatus, sterilising apparatus, electric lamps, torches and toasters.—Bio Electrics, Ltd., 18, Gibson Street, Glasgow.

STOCKS AND SHARES

TUESDAY EVENING.

THE international situation is held, as is bound to be the case, as the cause of all the ills from which Stock Exchange business and prices are now suffering. Probably the ordinary holiday influences are not wholly without some effect upon conditions in the City. But the air remains charged with political uncertainty. People do not care to undertake fresh liabilities of any kind. "We will wait and see what is going to happen," they say. So the favourable factors in the situation are ignored or overlooked. Figures announced by the Electricity Commissioners exhibit a further remarkable expansion in the units generated during July, but from the Stock Exchange market standpoint, they have served no practical purpose. The Commissioners sanctioned the borrowing of rather over two million pounds by public authorities for electricity supply in the four weeks ended August 12th.

Business throughout the Stock Exchange is very quiet. Yet when a more cheerful atmosphere does supervene, as it did on Tuesday in this week, activity awakens in a somewhat surprising fashion.

Home Railway Outlook

Investors seem to have made up their minds to keep out of the home railway market until such time as the companies and their men can find a permanent basis of agreement. It is true that small crowds gather every Wednesday morning in the Stock Exchange to await publication of the previous week's traffics. It is true that the weekly sweepstake of a shilling per head, on the total receipts—the winner has to buy a box of chocolates—arouses as lively interest as ever. Prices move up and down in fairly wide curves; but, in point of fact, there is no consistent volume of public activity in home railway stocks. A few weeks ago, the traffics showed such welcome signs of expansion that people began to be attracted, and to ask whether there might yet be a return of prosperity to the industry. The railways offered to raise the minimum rates of pay. The trade unions emulated Oliver Twist and asked for more. There were dark hints of a strike. Prices ebbed, as was inevitable. London Passenger Transport "C" is down a point, to 70½. On the 4 per cent. dividend last paid on the stock, the present price gives a return of £5 13s. 6d. per cent. Southern 5 per cent. preference is 2 lower, at 88½. Thomas Tilling ordinary touched 50s. before coming back to 47s. 6d., which left them 1/6 down on the week.

Cable and Wireless

Lack of public interest is the reason given in the market for a dull tendency in Cable and Wireless stocks. The preference has dropped to 87½; the ordinary at 51, has shed 10s. Valorous efforts are being made to energise international trade. Hardly a week passes without some evidence of an honest attempt to come to agreement between one nation and another. A proposed pact with Spain is now discussed. Upon the results of these endeavours the earnings of communication companies largely depend. Meanwhile, the stockholders patiently wait. Anglo-American Telegraph deferred at 21 is down a point. American Telephone and Telegraph at 177½ has lost the 2 points that it gained last week.

London Associated Electric

The ordinary stock of London Associated Electricity Undertakings, Ltd., has come back to 25s. per £1 unit, after touching 30s. earlier in the year. The interim dividend of 3 per cent. was paid last Friday, August 11th, and it is thought that there can be little doubt as to a repetition of a final dividend of 4 per cent. again, making 7 per cent. for the year.

The company was formed, it will be remembered, for the purpose of co-ordinating six of the well-known electric supply companies operating in London. Under the London Electricity Act, 1925, the undertaking is to be taken over by the London and Home Counties Joint Electricity Authority in 1971. Under the same Act, the company is allowed to make charges sufficient to cover all expenses and interest charges, plus dividends of 7 per cent. per annum on the ordinary capital. The company cut its charges a couple of years ago, but recently increased them owing to a diminution of profits last year.

On the appearance of the report, the shares gave way to the present figure. They now yield £5 12s. per cent. which, for shares of this character, may be considered a good return. Prospects of possible capital appreciation are rather prescribed by the falling away of profits last year. It is not anticipated that the dividends on the ordinary shares will drop below 7 per cent., but the latter rate is as high as expectation looks for over a period of several years to come.

Cossor

Shareholders in A. C. Cossor, Ltd., will probably feel a certain amount of satisfaction in the deal concluded last week, whereby 1,000,000 ordinary 5s. shares of the company, hitherto held by the vendor—A. C. Cossor (Holdings)—have passed into the hands of Mr. T. A. Macauley, a director and new chairman of the company. Mr. Norman Holland has taken 175,000, and the balance has gone, according to report, partly to the Prudential Assurance Company, partly to Sir Harold Wernher, chairman of Ericssons and Electrolux, and the rest to various other purchasers.

It is thought that the introduction of new blood into the control of the company will have a good effect upon its earnings, and that Cossor, under the present management and control, is likely to go ahead. So far as the prices of the shares are concerned, little alteration has been caused by the change, the ordinary 5s. shares being quoted at 3s. 9d., while the £1 preference shares stand at 14s. 9d. middle.

New Issues

Engineering and Lighting preference and ordinary shares show comparatively little change since dealings commenced in them a fortnight ago. The preference opened, it may be remembered, at 1s. premium; the present price is 9d. premium. The ordinary started off at the par price of 2s., and are now a shade above this. New issues of any size seldom appear during August, for the obvious reason that, with so many people away, the chance of a newcomer achieving popularity is rendered at least uncertain.

In America, it is of interest to observe that the Pennsylvania Power and Lighting Company has recently made an exceptionally large issue of bonds and that investors on the other side readily took the £19 millions of 30-year first mortgage 3¼ per cent. bonds at 106¼, and £5½ millions of 4¼ per cent. 35-year debentures at 104. After the subscription lists were closed, a premium of about 1 per cent. was established on both classes of bonds.

Electricity is popular in the United States just now, where consumption is running at record figures. Quarterly statements are published of the amount of electricity consumed, and it is expected that the figures for the three months ending next September will be well above those which made a record output in the quarterly statement for the three months which finished last December.

Consolidated Signal Preference

There have lately come on offer in the Stock Exchange market a few thousand Consolidated Signal 6 per cent. cumulative preference shares of £1 each, at 23s. These yield £5 7s. 6d. The dividend is payable once a year, in March; many people prefer to receive dividends semi-annually. But the security is good. To pay the dividend requires £9,355 a year; the last accounts showed profits of £49,000, allowing for income tax in each case. The ordinary shares received dividends of 36¼ per cent. for the last and the previous years. The £1 shares stand, as our price list shows, at 4½. Comparison with other preference shares of approximately similar class will suggest that the yield on these Consolidated Signal sixes is attractive. While the latter cannot take rank with better-covered, gilt-edged preference, they can fairly be included in any list of sound investments of their own kind.

The Status of Preference Shares

Not long ago, uneasy apprehensions arose around the status of such preference shares as carried anything like a high rate of dividend. A few, a very few, instances occurred in which it was proposed, in order to reduce the annual charge imposed upon profits by high preference dividends, to place a company into voluntary liquidation and repay the preference shares at par. The idea of such a thing being feasible was enough to send a tremor of nervousness through holders of preference shares that stood at substantial premiums above the nominal value. Prices gave way to some extent, and there was a noticeable halt in public demand for such investments. By degrees, however, the anxiety, natural enough in the circumstances, quietly subsided as the talk of repayment at par died down. There remains, to-day, a theoretical objection to preference shares quoted well over par, but so long as the security is well protected, the possibility of capital loss, through repayment of preference shares at their nominal value, is rarely referred to.

Miscellaneous Matters

A cursory glance through the final group in our price lists will suffice to show the fairly high yields offered to investment by shares in a number of companies connected with electrical engineering branches. Prices vary little, however, from week to week. In cases where A.P.D. is not at all likely to apply, there is N.D.C. to be taken into account and already, in the decline of unemployment, caution professes to foresee a chance of labour shortage within a few months. At the other end of this same scale, timidity enquires what will result from the gradual slacking off in rearmament as the Government programme approaches completion. These, and somewhat similar, arguments are quoted every day as the reason why high yields from sound industrial shares fail to attract the support the absence of which is responsible for the comparatively low levels at which so many prices are standing.

Overseas Stocks

Rangoon Electric Tramways ordinary shares have eased off to 34s. on a cut in the interim dividend. For the past eight years the interim has been equivalent to 2½ per cent.; it is now reduced to 1⅜ per cent. Current events in the Far East have tended to revive some uneasiness in regard to investments in companies locally concerned. Tokyo six per cent. bonds are again 3 down, which makes the price 38½. Provided the interest continues to be met, the yield now comes to 15½ per cent. on the money—which in itself witnesses to the pronounced uncertainty felt about the future dividend payments. Whitehall Electrics at 17s. have weakened. Anglo-Argentine preference and bonds are lower on the week.

ELECTRICAL COMPANIES' SHARES

Prices, Dividends and Yields

Company	1939 High-est	1939 Low-est	Dividend Pre-vious	Dividend Last	Price Aug. 15	Rise or Fall	Yield £ s. d. p.c.
Home Electricity Companies							
Bournemouth and Poole	68/3	63/9	15	15	63/9	—	4 14 4
British Power and Light	30/9	26/–	7	7	28/6	—	4 18 3
City of London	33/9	31/–	7½	7½	31/–	—	4 16 9
Clyde Valley	37/9	34/–	8	8	37/6	—	4 5 4
County of London	46/9	41/9	10½	10½	43/6	—	4 16 8
Edmundson's:							
7% Pref.	31/6	30/–	7	7	30/–	—	4 13 4
Ord.	27/9	23/–	9	6	25/6	—	4 13 2
Elec. Dis. Yorkshire	41/6	37/9	9	9	38/9	—	4 12 9
Elec. Fin. and Securities	47/9	45/–	12½	12½	47/6	—	5 5 3
Elec. Supply Corporation	51/9	47/6	12	12	47/6	—	5 1 1
Isle of Thanet	20/–	18/6	4	4	18/6	—	4 6 6
Lancs Light and Power	34/6	29/–	7½	7½	31/3	—	4 16 0
Llanelly Elec.	22/6	21/–	5½	5½	21/–	—	5 4 9
Lond. Assoc. Electric	30/–	25/–	7	7	25/–	—	5 12 0
London Electric	34/3	32/–	7	7	32/6	—	4 6 2
London Power Deb. Red.	106½	102½	5	5	104	—	4 16 2
Metropolitan	51/–	45/3	12	12	46/3	—	5 4 0
Midland Counties	38/9	34/–	8	8	37/6	—	4 5 4
Mid. Elec. Power	41/9	38/3	8	9	39/6	—	4 11 2
Newcastle Elec.	28/9	26/6	7	7	27/–	—	5 3 8
North Eastern Electric:							
Ordinary	32/3	28/6	7	7	30/6	—	4 11 10
7% Pref.	32/6	30/–	7	7	31/–	—	4 10 4
Northampton	48/–	45/–	10	10	47/6	—	4 4 2
Notting Hill 6% Pref. (£10)	13¼	12⅝	6	6	12⅝	—	4 14 1
Northmet Power:							
Ordinary	46/6	41/6	10	10	43/3	—	4 12 6
6% Pref.	29/–	27/–	6	6	27/–	−6d.	4 9 3
Richmond Elec.	29/–	27/3	7	7	27/6	—	5 1 10
Scottish Power	38/9	33/9	8	8	36/3	—	4 8 2
Southern Areas	22/9	19/6	5	5	20/–	—	5 0 0
South London	30/9	28/–	7	7	26/6	—	5 5 8
West Devon	23/3	22/6	5	5	22/6	—	4 9 0
West Glos.	21/3	18/–	2	2½	18/6	—	2 14 1
Yorkshire Elec.	38/6	34/9	8	8	37/6	—	4 5 4
Overseas Electricity Companies							
Atlas Elec.	4/3	2/–	Nil	Nil	2/6	—	—
Calcutta Elec.	39/–	29/–	10*	10*	30/–	—	—
Cawnpore Elec.	34/6	28/3	10	10	28/3	—	7 1 7
East African Power	26/3	22/6	7	7	22/6	—	6 4 5
Jerusalem Elec.	24/6	23/–	7	7	23/–	—	6 1 9
Kalgoorlie (10/–)	10/6	9/6	7½	7	10/3	—	7 6 4
Madras	31/–	22/6	8*	8*	22/6	—	—
Montreal Power	35½	31	1½	1½	34½	−½	—
Palestine Elec. "A"	29/6	21/3	7½*	5*	21/3	—	4 14 2
Perak Hydro-electric	18/9	15/–	7	6	15/9	—	7 12 4
Shawinigan Power	23½	20	85cts.	83cts.	21¼	+⅛	—
Tokyo Elec. 6%	61	38	6	6	38½	−3	15 11 8
Victoria Falls Power	73/9	60/–	12½	15	71/3	—	4 4 4
Whitehall Investments Pref.	19/6	16/–	7½	7½	17/–	−1/–	8 16 8
Public Boards							
Central Electricity:							
1950–70	112	106	5	5	108xd	−2	4 12 7
1955–75	115½	108	5	5	111¼	—	4 19 6
1951–73	106⅛	103¼	4¼	4¼	104¼	—	4 6 2
1963–93	95½	86	3½	3½	90½	—	3 17 6
London Elec. Trans. Gtd.	88½	84	2½	2½	85½	—	2 18 6
London & Home Counties							
1955–75	107⅛	105	4¼	4¼	106¼	—	4 4 6
Lond. Passenger Transport:							
A	114⅛	104½	4¼	4¼	106½	—	4 4 6
B	117⅛	105	5	5	105½	—	4 14 9
C	83½	64¼	4¼	4	70½	−1	5 13 6
West Midland Joint Elec., 1948–68	112½	108½	5	5	108½	—	4 12 2
Telegraph and Telephone							
American Tel. & Tel.	180	159	9	9	177½	−2	5 1 7
Anglo-Am. Tel.:							
Pref.	101½	89½	6	6	93	—	6 9 0
Def.	23⅜	19	1½	1½	21	−1	7 2 10
Anglo-Portuguese	24/–	19/9	8	8	20/9	—	7 14 2
Cable & Wireless:							
5½% Pref.	95½	75	4½	5½	87½	−1	6 5 9
Ord.	55	34	4	4	51	−½	7 16 10
Income	100	95½	—	—	97⅝	—	4 2 1
Canadian Marconi $1	5/6	3/9	—	Nil	4/9	−3d.	—
Globe Tel. & Tel.:							
Ord.	31/3	23/6	7½*	7½*	30/–	—	5 0 0
Pref.	26/9	23/3	6	6	25/–	—	4 16 0
Great Northern Tel. (£10)	38	27½	20	20	29	—	6 18 0
Inter. Tel. & Tel.	10½	7	Nil	Nil	7	−½	—
Marconi-Marine	30/–	23/–	7½	10	27/6	—	7 5 6
Oriental Telephone Ord.	2½	46/3	12*	12*	2 7/16	—	4 16 0
Radio Corpn.	8⅞	6	8	6	6½	—	—
Telephone Props.	14/–	12/9	5	6	13/9	—	8 14 6
Telephone Rentals (5/–)	10/–	8/6	10	10	9/3	—	5 8 1
Western Union	28	19½	2⅜	—	27½	—	—
Traction and Transport							
Anglo-Arg. Trams:							
First Pref. (£5)	7/6	3/6	Nil	Nil	5/–	−1/16	—
4% Inc.	16	7	Nil	Nil	9	−1	—
British Electric Traction:							
Def. Ord.	1025	700	5	5	875	—	—
Pref. Ord.	164	155	8	8	155	—	5 3 3
Bristol Trams	52/6	37/3	8	10	52/6	—	3 16 4
Brazil Traction	13	7⅞	$1	50c.	8⅛	—	—
Calcutta Trams	25/6	22/–	8	8	24/–	+6d.	6 13 4
Cape Elec. Trams	18/–	16/9	5	6	17/6	—	6 17 2
Lancs Transport	37/9	32/6	10	10	37/–	−6d.	5 8 1
Mexican Light:							
1st Bonds	25	21	5	5	25	—	—
Rio 5% Bonds	81	47	5	5	67	—	7 9 3
Southern Rly:							
5% Prefd.	75½	48	5	5	63	—	7 18 10
5% Pref.	99⅛	80	5	5	88½	−2	5 13 0
T. Tilling	2½	39/6	10	10	47/6	−1/16	4 4 2
Tilling & B.A.	54/6	50/–	10	9*	53/9	—	3 7 0
West Riding	37/9	31/3	10	10	36/3	—	—
Equipment and Manufacturing							
Aron Electricity Ord.	32/3	28/9	15	15	31/3	—	10 8 8
Assoc. Elec.:							
Ord.	45/3	34/9	10	10	41/–	—	4 17 7
Pref.	36/6	34/–	8	8	35/–	—	4 11 5
Automatic Telephone & El.	47/6	39/3	10	12½	47/6	—	5 5 3
Babcock & Wilcox	48/–	37/–	10	12½	47/–	—	5 6 5
British Aluminium Ord.	58/9	48/9	12½	12½	58/3	—	4 6 0
British Insulated Ord.	88/–	77/–	20	20	83/9	—	4 15 10
British Thermostat (5/–)	16/–	12/–	18½	18½	13/9	—	6 14 7
British Vacuum Cleaner (5/–)	22/6	14/–	40	40	15/–	—	—
Brush Ord.	5/9	4/6	Nil	Nil	5/–	—	—
Callender's	92/–	60/–	20	15	63/9	−½	4 14 1
Chloride Elec. Storage	82/3	62/6	20	15	3 3/4	—	4 10 4
Consolidated Signal	96/–	80/9	36½	36½	82/6	—	8 16 9
Crabtree (10/–)	25/6	21/6	17½	17½	22/6	—	7 15 4
Crompton Parkinson:							
Ord. (5/–)	21/–	14/9	12½	15	19/6	—	—
E. K. Cole (5/–)	9/–	4/–	10	Nil	6/–	+3d.	—
Elec. & Musical Industries (10/–)	14/9	8/9	10	5	9/9	−3d.	5 2 7
Electric Construction	38/6	30/6	12½	13½	35/–	—	7 14 3
Enfield Cable Ord.	58/6	48/6	25	16½	48/9	−½	6 6 7
Electrical Switchgear (10/–)	27/–	23/9	16	16	23/9	—	6 14 9
English Electric	36/6	30/3	10	10	36/–	—	5 11 1
Ensign Lamps (5/–)	16/9	13/9	—	25	16/9	+1/–	7 9 2
Ericsson Tel. (5/–)	43/–	35/–	25*	25*	41/3	−1/16	3 0 8
Ever Ready (5/–)	24/–	18/6	35	30	19/–	—	7 18 0
Falk Stadelmann	27/–	18/9	10	6	20/–	—	6 0 0
Ferranti Pref.	25/6	22/6	7	7	23/–	—	6 1 9
G.E.C.:							
Pref.	31/9	29/3	6½	6½	31/3	—	4 3 2
Ord.	82/–	70/9	17½	20	74/6	—	5 7 1
Greenwood & Batley	27/6	24/6	7	15	26/3	—	11 9 0
Hall Telephone (10/–)	22/3	19/3	15	15	20/–	—	7 10 0
Henley's (5/–)	21/–	17/9	20	20	18/9	−9d.	5 6 8
4½% Pref.	23/–	21/–	4½	4½	21/3	—	4 4 8
Hopkinsons	46/3	37/3	12½	15	45/–	—	6 13 4
India-Rubber Pref.	21/3	20/–	5½	5½	20/–	—	5 10 0
Intl. Combustion	120/–	97/–	32½	32½	5 1/16	—	5 12 1
J. Lucas	60/–	52/–	15	15	60/–	—	5 0 0
Johnson & Phillips	41/3	32/–	12½	12½	40/–	—	6 5 0
Lancashire Dynamo	68/–	57/6	25	25	62/6	—	7 18 8
Laurence Scott (5/–)	12/–	10/–	15	15	10/3	—	7 6 4
London Elec. Wire	31/6	28/6	12	7½	28/9	—	5 4 4
Mather & Platt	50/–	42/6	13½	13½	43/9	—	6 3 3
Metropolitan Elec. Cable Pf.	21/3	21/–	5½	5½	21/3	—	5 3 6
Murex	85/9	63/9	20	20	78/9	−1/16	5 1 6
Pye Deferred (5/–)	13/9	7/6	25	25	8/3	−6d.	15 3 0
Revo (10/–)	35/6	29/–	17½	17½	28/–	—	6 5 9
Reyrolle	61/–	52/6	12½	12½	56/3	—	4 9 0
Siemens Ord.	26/9	20/6	7½	7½	23/9	—	6 6
Strand Elec. (5/–)	5/6	3/9	5	10	3/9	—	3 6 8
S. Smith (1/–)	9/9	6/–	37½	50	8/9	+6d.	5 14 4
Switchgear & Cowans (5/–)	15/–	11/3	20	20	12/–	—	8 6 8
Telegraph Condenser (10/–)	7/6	5/–	5	—	7/6	—	—
Telegraph Construction	2½	37/6	10	10	38/9	+1/4	5 3 1
Telephone Mfg. (5/–)	10/–	8/–	9	9	9/3	—	4 17 3
Tube Investments	91/–	82/9	23½	23½	90/–	—	5 7 7
Vactric (5/–)	4/3	2/3	10	4	2/3	—	8 18 0
Vickers (10/–)	24/6	18/–	10	10	18/–	−3d.	5 11 1
Westinghouse Brake	54/9	43/9	17½	17½	50/–	—	7 0 0
Walsall Conduits (4/–)	31/9	24/–	55	55	25/9	—	8 10 8
West, Allen (5/–)	7/6	5/9	7½	10	6/6	—	7 13 10

* Dividends are paid free of Income Tax.

NEW PATENTS

Electrical Specifications Recently Published

Compiled by a firm of chartered patent agents. The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1s. *each*) *can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.*

1937

20066. "Electric medicinal vaporiser." E. A. Diamond. July 20th, 1938. (509593.)

28358. "Mercury or other conducting liquid switches." A. Cianchi. October 18th, 1937. (509817.)

28440. "Electrical timing devices." Siemens & General Electric Railway Signal Co., Ltd., and H. J. N. Riddle. October 19th, 1937. (509695.)

28735. "Electrically operated vibrators." C. S. Weyandt. October 21st, 1936. (509818.)

31889. "Electric signalling systems." Standard Telephones & Cables, Ltd., E. M. Deloraine and A. H. Reeves. November 19th, 1937. (509820.)

34431. "Electrically heated devices such as soldering-irons, flat-irons, or the like." Igranic Electric Co., Ltd. December 13th, 1937. (509599.)

34456. "Auto-transformers." Soc. Savoisienne de Constructions Electriques. December 19th, 1936. (509600.)

34965. "Earthing-devices for high-frequency radio apparatus." E. C. Cork, and J. L. Pawsey. December 17th, 1937. (Cognate application 7179/38.) (509500.)

35100. "Electric insulated wires and cables." British Insulated Cables, Ltd., B. Welbourn, F. J. Brislee and E. A. Bayles. December 18th, 1937. (509760.)

1938

718. "DC dynamo-electric machines controlling the supply to electric motors and other variable loads." English Electric Co., Ltd., E. A. Binney, H. S. Pound-Corner, and H. B. Sedgfield. January 10th, 1938. (Cognate application 623/39.) (509684.)

1403. "Means for controlling the speed of alternating-current induction motors." Allmänna Svenska Elektriska Aktiebolaget, and U. Lamm. January 15th, 1938. (509824.)

1517. "Choke coils." British Thomson-Houston Co., Ltd. January 18th, 1937. (509825.)

1601. "Cathode-ray tube apparatus for television and like systems." Scophony, Ltd., and A. H. Rosenthal. January 18th, 1938. (Cognate applications 14171/38, 14806/38, 14807/38, 20278/38 and 20636/38.) (509766.)

1602. "Electric rectifying circuits." Scophony, Ltd., and S. H. M. Dodington. January 18th, 1938. (509604.)

1648. "Control systems for electric motors." Electrical Research Products, Inc., and K. E. Latimer. January 18th, 1938. (509503.)

1657. "Negative feed-back amplifiers." Telefunken Ges. für Drahtlose Telegraphie. January 18th, 1937. (509605.)

1672 "Spring-driven impulse dials of the type used in telephone systems." Standard Telephones & Cables, Ltd., B. B. Grace, and H. H. J. Sparkes. January 18th, 1938. (509827.)

1680. "Electric insulators." Bullers, Ltd., and H. C. R. Dagnall. January 18th, 1938. (509606.)

1684. "Electric synchronous motor clocks." H. K. Morrison. January 18th, 1938. (509608.)

1685. "Methods of speed control for electric motors." British Thomson-Houston Co., Ltd., and B. Adkins. January 18th, 1938. (509769.)

1694. "Control of induction electric motors." C. N. Sayer, and Metropolitan-Vickers Electrical Co., Ltd. January 18th, 1938. (509610.)

1706. "Photo-electrical apparatus for the reproduction of sound films." O. K. Kolb. January 19th, 1938. (509700.)

1731. "Electrostatic condensers." R. Bosch Ges. January 20th, 1937. (509701.)

1761. "Variable electric condensers." S. G. Brown, and Telegraph Condenser Co., Ltd. January 19th, 1938. (Cognate application 11800/38.) (509886.)

1769. "Synchronisation method and means for television." Radio Akt.-Ges. D. S. Loewe. January 20th, 1937. (509831.)

1835. "Systems of electric motor control." British Thomson-Houston Co., Ltd., H. C. Hastings, and F. F. C. Usher. January 19th, 1938. (509833.)

1852 "Electric signal amplifiers incorporating voice-operated devices." L. E. Ryall. January 20th, 1938. (509613.)

1970. "Electrostatic instruments for detecting seismic vibrations." B. Pogany, and J. Fekete. January 20th, 1937. (509783.)

2039. "Television receiving apparatus." Scophony, Ltd., and F. Okolicsanyi. January 21st, 1938 (509715.)

2063. "Boxes or casings with removable covers or lids for electrical apparatus." General Electric Co., Ltd., and H. J. Eley. January 21st, 1938. (509894.)

2064. "Switching stations for electric power supply systems." General Electric Co., Ltd., and H. J. Coates. January 21st, 1938. (509835.)

2067. "Electrical insulating material." Standard Telephones & Cables, Ltd., and J. K. Webb. January 21st, 1938. (509836.)

2073. "Means for the generation of impulse voltages." British Thomson-Houston Co., Ltd. January 21st, 1937. (509614.)

2087. "Electron-discharge valve amplifiers for ultra-short wave operation." Marconi's Wireless Telegraph Co., Ltd. January 21st, 1937. (509615.)

2148. "Electric motor arrangements." Sulzer Freres Soc. Anon. January 23rd, 1937. (509841.)

2189. "Phase-changing electrical circuit arrangements suitable for use in directional wireless systems." Marconi's Wireless Telegraph Co., Ltd., S. W. H. W. Falloon and G. Millington. January 22nd, 1938. (509843.)

2191. "Carrier-wave transmitters." Marconi's Wireless Telegraph Co., Ltd., E. Green. January 22nd, 1938. (509845.)

2194. "Multiple-position electric switches." British Thomson-Houston Co., Ltd. January 22nd, 1937. (509899.)

2195. "Starting systems for synchronous dynamo-electric machines." British Thomson-Houston Co., Ltd. January 23rd, 1937. (509900.)

2196. "Fire-alarm systems or the like." Automatic Telephone & Electric Co., Ltd., and W. J. Brown. January 22nd, 1938. (509846.)

2286. "Electrically driven aircraft." H. T. Jones. January 24th, 1938. (Cognate applications 2287/38 and 3411/39.) (509848.)

2297. "Multiple-contact electric switching devices." Automatic Telephone & Electric Co., Ltd. (Associated Electric Laboratories, Inc.). January 24th, 1938. (509849.)

2326. "Electric impedance networks." H. D. M. Ellis and C. G. Mayo. January 24th, 1938. (509787.)

3188. "Electrical indicating instruments for use in or in proximity to circuits carrying high-frequency currents." N. W. C. Polyblank (Legal representative of W. J. Polyblank, dec.). February 2nd, 1938. (509791.)

3190. "Tuning of radio receivers." E. K. Cole, Ltd., and G. Bradfield. February 2nd, 1938. (509511.)

3366. "Covers for electric wall switches and other like fittings used in electricity distributing systems." R. Bain and N. Allday. February 3rd, 1938. (509512.)

3580. "Electro-magnetic relays." Standard Telephones & Cables, Ltd. March 10th, 1937. (509719.)

4323. "Electric cable installations." Felten & Guilleaume Carlswerk Akt.-Ges. February 25th, 1937. (509722.)

4452. "Luminescent materials for use with electric discharge tubes." Franco-British Electrical Co., Ltd., and A. H. Brackensey. February 12th, 1938. (509723.)

5465. "Alternating-current electric circuit arrangements." Ionlite, Ltd., and W. A. Stickley. February 21st, 1938. (509628.)

5572. "Electric relays." Express Lift Co., Ltd., J. K. Slater and L. E. W. Wells. February 22nd, 1938. (509794.)

6651/2. "Quick-action electric switches." General Electric Co., Ltd., and H. L. Bentley. March 3rd, 1938. (509633/4.)

6831. "Illuminated signs." General Electric Co., Ltd. (Patent-Treuhand-Ges. für Elektrische Glühlampen). March 4th, 1938. (509515.)

7638. "High-pressure metal-vapour electric discharge lamps." General Electric Co., Ltd., and K. G. Schnetzler. March 11th, 1938. (Cognate application 28671/38.) (509801.)

11224. "Electric transformers." British Thomson-Houston Co., Ltd. April 15th, 1937. (509812.)

13134. "Closing mechanism for electric circuit-breakers." G. Ellison, Ltd., and H. C. Fox. May 3rd, 1938. (509522.)

15332. "Electric transformers." British Thomson-Houston Co., Ltd. May 24th, 1937. (509862.)

15832. "Telephone systems." General Electric Co., Ltd., and J. Scowcroft. May 27th, 1938. (509527.)

16554. "Apparatus for converting electrical oscillations into mechanical oscillations or vice versa, or electrical oscillations of one amplitude into electrical oscillations of another amplitude." Compagnie Generale de Telegraphie Sans Fil, Y. Rocard and S. Beterod. June 2nd, 1938. (509865.)

17153. "Electro-magnetic device for measuring mechanical forces and moments." H. Maihak Akt.-Ges. June 21st, 1937. (509647.)

17670. "Transmitting arrangements for radio direction-finding systems." C. Lorenz Akt.-Ges. June 19th, 1937. (509648.)

20664. "High-frequency inductance coils having adjustable magnetic cores." C. Lorenz Akt.-Ges. July 12th, 1937. (509869.)

20692. "Iron-cored choke coils having adjustable air gaps." British Thomson-Houston Co., Ltd. July 12th, 1937. (509870.)

23092. "Inductance coils and the like." British Thomson-Houston Co., Ltd. August 6th, 1937. (509872.)

24635. "Electric induction motors with a plurality of stators and rotors. S. H. B. Zachariassen. August 23rd, 1937. (509726.)

24893. "Electric condensers." Aerovox Corporation. February 23rd, 1938. (509543.)

25865. "Electric overload trip switches." H. B. Prentice and J. G. Fielding. September 5th, 1938. (509879.)

26705. "Radio direction finding apparatus." Standard Telephones & Cables, Ltd. September 17th, 1937. (509731.)

27091. "Electric resistance spot-welding." B. Berghaus. October 9th, 1937. (509548.)

28294. "Method of and circuits for producing biasing potentials between electrodes of electron-discharge devices." Electrical Research Products, Inc. October 5th, 1937. (509658.)

28339. "Electric cables." Britannic Electric Cable & Construction Co., Ltd., and H. R. Wolfenden. September 29th, 1938. (509554.)

29038. "Glass electrodes." Jenaer Glaswerk Schott & Gen. October 16th, 1937. (509555.)

29335. "Electric power-transmission systems." British Thomson-Houston Co., Ltd. October 9th, 1937. (Addition to 456222.) (509558.)

29570. "Coil filament manufacture." A. Hofmann & Co. October 15th, 1937. (509733.)

32545. "Systems of electric spot-welding." British Thomson-Houston Co., Ltd. November 9th, 1937. (Addition to 495484.) (509671.)

33979. "Arrangements for the sparkless opening of inductive direct-current circuits by means of thermostats." O. Bormann. November 22nd, 1938. (509675.)

37527. "Electron-discharge tubes." Telefunken Ges. für Drahtlose Telegraphie. December 27th, 1937. (509744.)

2303. "Valve devices for use with electric switches." British Thomson-Houston Co., Ltd. January 22nd, 1938. (509685.)

3896. "Electrical control of the tuning mechanism of radio receiving apparatus." Naamlooze Vnnootschap Philips' Gloeilampenfabrieken. February 8th, 1938. (509750.)

17441. "Electric signal amplifiers incorporating voice-operated devices." L. E. Ryall. January 20th, 1938. (Divided out of 509613.) (509693.)

CONTRACT INFORMATION

Particulars of work for which tenders are invited, contracts placed, and building schemes promising work for electrical contractors and traders

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses. Further details of items marked with an asterisk can be obtained from the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, London, S.W.1.

Ardrossan (AYRSHIRE).—August 21st. Town Council. Electric lighting work at Parkhouse and Whitlees housing estate (128 houses). Joint Town Clerks, Burgh Chambers (deposit £1 1s.).

Australia. — MELBOURNE. — September 12th. Telephone equipment, comprising filters, indicators, terminal equipment, loading coils, &c. (T. 25393/39.)*

August 21st. Electricity Department. Control cable. (T. 25388/1939.)*

September 19th. Postmaster-General's Department. Automatic telephone switching equipment. (T. 25751/39.)*

September 19th. Telephone and telegraph cable. (T. 25750/39.)*

September 26th. Posts and Telegraphs Department. Automatic generator voltage regulators. (T. 25902/39.)*

December 12th. State Electricity Commission of Victoria. Two 12,000-kW water-driven turbo-generators and accessory plant. (T. 25686/39.)*

BRISBANE.—September 12th. City Electric Light Co., Ltd. Four 750-kVA transformers. (T. 25376/39.)*

Ayr.—August 21st. County Council. Electrical work for reconstruction of Ardrossan police station and two houses. Schedules from county architect.

Belfast.—September 1st. Electricity Department. 33-kV and 6.6-kV switchgear and interconnecting cables, and AC motors and wiring to replace DC installations at consumers' premises. (See this issue.)

Birmingham.—September 8th. Electric Supply Department. One 12-panel, 11,000-V, 250-kVA duplicate busbar metal-clad switchboard. Coal-handling plant and ash-disposal plant at Hams Hall "B" power station. (August 11th.)

Bristol.—September 6th. Electricity Department. E.h.v. switchgear, l.v. substation switchgear, and 6.6-kV and 11-kV transformers. (See this issue.)

September 5th. Corporation. Installation of electrical services in the clinics at Southmead Hospital. (See this issue.)

Derby.—September 11th. Corporation. Automatic vehicular traffic control signals at junction of Friargate, Ford Street and Stafford Street. (August 4th.)

Dewsbury.—August 25th. Electricity Department. Two outdoor 10,500-V, 5,000-kVA reactors. (August 11th.)

Dover.—September 1st. Borough Council. Material for change-over in Whitfield area. (See this issue.)

Dundee.—August 21st. Public Health Committee. Lighting and heating installation, Maryfield Hospital Ante-Natal clinic. City quantity surveyor, 21, City Square. Tenders to Town Clerk.

Dunfermline.—August 28th. Town Council. Electric lighting of 191 houses at Brucefield. Schedules from C. R. Douglas & Son, 15, East Port, Dunfermline. Tenders to Town Clerk (deposit £1 1s.).

Edinburgh.—August 19th. Corporation. Installation of an electric goods lift at Slaughter House, Gorgie. Town Clerk.

India.—NEW DELHI.—November 28th. India Stores Department, Electrical Section. DC ceiling fans. (T. 25344/39.)*

NEW DELHI.—November 28th. Indian Stores Department, Electrical Section. AC ceiling fans. (T. 25345/39.)*

MADRAS.—August 21st. Electricity Department. Indoor and outdoor switchgear. (T. 25277/39.)*

SIMLA.—August 22nd. Indian Stores Department. One 10-kW, 220/230-V, DC generating set. (T. 25273/39.)*

September 14th. Indian Stores Department, Electrical Branch. Bare copper conductors. (T. 25927/39.)*

Iraq.—BAGDAD.—October 24th. Central Foreign Purchasing Board. Underground cables and accessories. (T. 25439/39.)*

Kirkcaldy.—September 9th. Automatic fire-fighting installation. (See this issue.)

Leeds.—Incorporated Association of Electric Power Companies. Electric clocks. (August 11th.)

Lincoln.—August 28th. North Lindsey Water Board. Pilot cable from Scotney Farm and Winterton Holmes to Sawcliffe Reservoir. (August 11th.)

Lochgelly (FIFE).—August 25th. Town Council. Twenty steel lamp standards, lamp brackets and fittings and electric lamps for street lighting installation. Town Clerk.

London.—H.M. OFFICE OF WORKS.—August 23rd. Propeller type electric fans. (August 4th.)

August 24th. Steel conduits and fittings for electric wiring. (August 11th.)

August 25th. Switchboards and cables at the National Physical Laboratory, Teddington. (August 11th.)

ISLINGTON.—September 13th. Borough Council. One 1,500-kVA and one 5,000-kVA Scott connected transformer. (August 4th.)

SOUTHWARK.— August 21st. Borough Council. Electric lighting and power installations at new baths, Borough High Street. (August 4th.)

Newcastle-on-Tyne. — Tyne Improvement Commission. Electrical apparatus, transformers and underground cable, including lighting and heating of two 5,500-V static sub-stations at Tyne Dock. A. Blacklock, secretary, Bewick Street.

New Zealand.—WELLINGTON.—September 19th. Public Works Department. Two three-phase oil circuit-breakers, each having a rupturing capacity of 250,000 kVA at 33-kV, complete with accessories. (T. 25365/39.)*

October 3rd. Four single-phase potential transformers. (T. 25363/39.)*

October 17th. 50-kV outdoor switchgear and steelwork, complete with all necessary insulators and accessories for Maungatapere sub-station. (T. 25364/39.)*

October 24th. Mimic bus control panels complete with steel frames, panel fixing bolts, labels, instruments, control switches, indicators and terminal boards. (T. 25360/39.)*

September 5th. One Diesel-driven lighting plant. (T. 25832/39.)*

September 21st. Metal-cased condensers. (T. 25604/39.)*

October 24th. One 110-kV, three-phase, outdoor isolating switch. (T. 25830/39.)*

October 24th. 11,000-V switchgear and associated equipment. (T. 25831/39.)*

Northallerton.—North Riding County Council. Installation of electric lighting and power at the new Northallerton senior school. Plans by the County Architect, County Hall.

Nottingham.—September 21st. Corporation. Insulated food trolleys for the city hospital. (See this issue.)

County Council. Contractors desirous of tendering for the electrical installation at the new county hall and offices must send their names and addresses by September 2nd. (See this issue.)

Plymouth.—August 25th. City Council. Stores, including electrical installation materials. (August 11th.)

Reigate.—August 31st. Corporation. Rewiring of the electrical installation at headquarters fire station. (See this issue.)

Salford.—August 28th. Corporation. Sodium street lamps. (See this issue.)

Scunthorpe. — September 4th. Electricity Department. One sheet-steel knosk. (August 4th.)

South Africa. — JOHANNESBURG. — August 31st. Union Tenders and Supplies Board. One 50-kVA transformer and high- and low-voltage switchgear. (T. 25350/39.)*

September 9th. City Council. Copper conductors. (T. 25656/39.)*

September 13th. Seven cable test sheath fault detector panels. (T.Y. 25662/39.)*

November 17th. Electricity Supply Commission. 33-kV switchgear and auxiliary plant. (T. 25663/39.)*

CAPE TOWN.—August 30th. Electricity Supply Commission. Pole fittings, including line, tension and angle cross-arms, earth wire clamps and galvanised steel wire. Pin type and suspension strain insulators. (T. 25642/39.)*

PRETORIA.—September 14th. Public Works Department. Transformers and switchgear. (T.Y. 25882/1939.)*

September 7th. Union Tender & Supplies Board. Seventy-two floodlights for hangar lighting at various centres. (T. 25653/39.)*

September 7th. Architectural lamps. (T. 25647/39.)*

PIETERMARITZBURG. — September 6th. Electric cooking apparatus and food mixer. (T. 25648/39.)*

NATAL. — September 6th. Electric laundry machinery, cooking and food preparation equipment and refrigerator. (T.Y. 25664/39.)*

Southampton. — August 29th. Electricity Department. Electrical installations at Station Road schools, Sholing. (August 4th.)

Stoke-on-Trent.—September 13th. North West Midlands J.E.A. Three transformer kiosks. (See this issue.)

September 6th. Electrical Engineer's Department. Electric cookers, washboilers, kettles, water heaters and circulators. (August 4th.)

Sunderland.—August 28th. Electricity Undertaking. P.i. cables, v.i.r. wire, meters and electric lamps for twelve months. (August 4th.)

Swinton and Pendlebury.—August 28th. Electricity Department. Distribution transformers. (See this issue.)

Tredegar.—August 21st. U.D.C. Two 250-kVA transformers. (August 11th.)

Walsall.—September 4th. Electric Supply Department. One 500-kW, mercury-arc rectifier, one 6-panel DC switchboard and remote supervisory control equipment. (August 4th.)

August 25th. One 2,000-kVA outdoor type transformer. (August 4th.)

West Ham.—September 4th. Electricity Department. V.i.r. and tough rubber-sheathed wires and cables for twelve months. (August 11th.)

August 24th. Borough Council. Two electrically operated goods lifts at Whipps Cross Hospital. Borough engineer, Town Hall, E.15.

West Hartlepool.—Town Council. Installation of electric wash boilers in 116 houses and 40 bungalows on the Seaton Lane estate and 182 houses on the Dyke House estate. Plans by F. Durkin, borough engineer.

Orders Placed

Blackpool.—Gas Committee. Accepted. Rectifier equipment.—Hewittic Electric Co.

Cardiff.—Electricity Committee. Accepted. Metering equipment (£95).—Aron Electricity Meter, Ltd. Two switchboards (£3,869 each).—Allen West, Ltd. 33,000-V cable and pilot cable.—Pirelli-General Cable Works. Transformers.—B.T.H. Co.; English Electric Co.

Colchester.—Education Committee. Accepted. Installation at East Ward school (£213).—E. H. Ruddock.

Electricity Committee. Accepted. Service lift at meter-testing station (£269).—Hammond & Champness, Ltd.

Darlington.—Town Council. Accepted. Overhead electric line in Snipe Lane (£179).—Reid, Ferens & Co.

Epsom.—Surrey County Council. Accepted. Lifts for county hospital (£1,680).—Evans Lifts, Ltd. Electric wiring (£5,500).—Chapman, Lowry & Puttick.

Keighley.—Electricity Committee. Accepted. Overhead line at Haworth (£187).—Craven and District Electrical Construction Co., Ltd.

London.—City Police Committee. Recommended. Alternative electricity supplies at police premises (£2,024).—Ruston & Hornsby, Ltd.

Madeley (SALOP).—Urban District Council. Accepted. Installation at the Prince Street housing site (£260).—E. W. Jones.

Middlesbrough.—Town Council. Accepted. Cables.—Britannic Electric Cable Co.; Aberdare Cables. Transformers.—Electric Construction Co. Switchgear.—English Electric Co.

Sunderland.—Town Council. Accepted. Electrical installation, St. Benet's School (£52).—Redhead & Brown.

Sutton Coldfield. — Electricity Committee. Recommended. Transformers and switchgear (£5,023).—G.E.C.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Arbroath.—Large extensions to tannery, Ponderlaw Street; Alexander Swirles & Son, Ltd.

Barking.—Extensions to factory, Jenkins Lane; Gross & Sherwood, Ltd.

Barnsley.—Infants' school, Royston; E. M. Rice, architect, 36, St. Giles, Oxford.

Beckenham.—Fire station (£12,576), Bromley Road, for T.C.; borough surveyor.

Bilston.—Fire station, Wolverhampton Street; borough surveyor.

Birmingham.—Bakery, Holt Street, Aston, for the Birmingham Co-operative Society, Ltd., High Street; Co-operative Building dept., Woodcock Street. Omnibus depot, Crossfield Rd., for T.C.; H. J. Manzoni, city surveyor. Rebuilding the Aston Hippodrome; E. Harris & Son, builders, Cope Street, Coventry. Rolling mills, Warstone Lane, for Taylor & Co., George Street, Birmingham; T. Elvins & Son, builders, Soho Hill.

Blackpool.—Houses (34), Anchorsholme Lane; A. A. Holt, Ltd. Houses (40), Neville Avenue; R. & H. Fletcher. Houses (35), Plymouth Road; R. Fielding & Son. Eight boarding houses, Red Bank Road; A. Seddon & Co., Ltd. Cinema, Bloomfield Road and Queen Victoria Road; R. Simpson, Lytham Road, South Shore.

Bolton.—Senior school, St. Anne's; G. & J. Seddon, Ltd.

Bridgwater.—Factory, Washington Gardens, for S. Leffmann, Ltd., 3, Pine Street, London, E.C.1.

Broughton (CUMBERLAND). — Houses (20), for North Eastern Housing Association, Ltd., Northumberland Road, Newcastle-on-Tyne.

Bursiem.—Houses (18), Grange estate, Cobridge; J. E. Homer.

Caernarvon.—Houses (50), Llys Meirion and Cae Gwyn estates; Williams and Williams, builders, Rhilwas.

Cannock.—Houses (64), John Street, Wimblebury; Taylor & Kelk, builders, Attenborough, Nottinghamshire. Houses (68) and bungalows, Bradbury Road; R. Edmunds, builder, Cheslyn Hay.

Cardiff.—Houses (122), Ely; city engineer.

Cheadle.—Cinema with shops, old Rectory site, for Cheadle Development Co.; J. L. Edwards, architect, 51, South King Street, Manchester.

Cheltenham.—Alterations to Cheltenham College (£17,000); O. P. Milne, architect, 64, Wigmore Street, London, W.1.

Cheshire.—Senior school, Tarporley, for the E.C.; F. A. Browne, county architect, The Castle, Chester.

Colchester.—Extensions to police station (£10,678); F. Hutton & Son, Ltd.

Cumberland. — School, Keswick (£20,000); J. H. Haughan, county architect, 4, Alfred Street North, Carlisle.

Darlington.—Houses, Swaledale Avenue; Bussey and Armstrong, builders, Brinkburn Road.

Doncaster.—Houses (30); R. E. Ford, estates surveyor.

Dorking.—Extensions to court house (£7,037); H. H. & F. Roll, Ltd.

Dorset.—School, Bridport, for the E.C.; county architect, County Offices, Dorchester.

Dunston-on-Tyne.—Factory, the North Eastern Trading estate; Tasker and Childs, architects, Trinity Buildings, New Bridge Street, Newcastle-on-Tyne.

Durham.—Cinema, Bowburn, for F. Iseton; G. W. Lazenby and Co., Ltd., builders, Ferryhill.

East Riding.—Hospital, Market Weighton, and adaptation of Patrington Institution as hospital, for C.C.; county architect, County Hall, Beverley.

Enfield.—Municipal offices, Silver Street, for T.C.; borough surveyor.

Farnham.—Nurses' home, County Hospital (£40,000); Saxon, Snell & Phillips, architects, 9, Bentinck Street, London, W.1.

Fleetwood.—Omnibus station and terminus, Pharos Street, for T.C.; borough surveyor.

Gateshead.—Factory, for North-Eastern Aircraft Components, Ltd.; North-Eastern Trading Estates, Ltd., Team Valley estate. School, for the E.C.; borough engineer. Alterations to isolation hospital for the T.C. (£1,200); J. F. Dickman, builder, Newbiggin.

Glasgow.—Houses (16), Florida Drive; housing director. Houses (2,642), Greenfield and Penilee, for Corporation; the architect. Office block, &c., for Yarrow & Co., Ltd., Scotstoun; C. J. McNair & Elder, architects, 272, St. Vincent Street. Premises, 51-55, Westmuir Street, and 28-54, Dervaig Street, for F. W. Woolworth & Co., Ltd., 1-5, New Bond Street, London; the secretary. Additions to foundry, Keppochhill Road; Allan Ure & Co., Ltd. Additions to Scotstoun Ordnance works, South Street; Harland & Wolff, Ltd. Extensions to Cowglen Isolation Hospital (£25,000); city engineer.

Glendale.—Houses (9), Wooler, for the R.D.C.; R. Carse and Son, builders, Amble.

Guisborough (YORKSHIRE).—Additions to offices, Rectory Lane; Blackett, Hutton and Co., Ltd.

Hamilton.—Gymnasium and six classrooms, Hamilton Academy (£29,000); architect, County Council, Hamilton.

Harpenden (HERTFORDSHIRE).—Domestic science building and extensions to National Children's Home Senior Elementary Mixed School; G. H. Herring, architect, 21, Milton Road, Harpenden.

Keighley.—Estate development, Haworth; H Burrell.

Lancashire.—Garage and motor patrol training school (£40,000), Hulton, for Standing Joint Committee; S. Wilkinson, architect, County Offices, Preston.

Leicester.—Extensions to Swain Street Institution (£23,836), for T.C.; city surveyor.

Lichfield.—Shops, Greenhill area; city engineer.

Lincolnshire.—Police buildings and courthouse, Scunthorpe (£60,000), and school, Skegness, for the C.C.; county architect, County Offices, Newland, Lincoln.

London.—(ST. JOHN'S WOOD).—Offices and shops, Marlborough Street station; London Passenger Transport Board, 55, Broadway, Westminster, S.W.1.

Middlesbrough.—Houses (313), Cargo Fleet Lane, for Premier Dwellings, Ltd.; H. C. Garbutt, architect, 18, Albert Road. A.R.P. report centre, The Gables, for the T.C. (£1,500) and emergency hospital, Hemlington, for the T.C. (£30,000); N. Thompson, Ltd., builders, Linthorpe.

Morecambe.—Extensions to factory. Westgate; Souplex, Ltd.

Morpeth (NORTHUMBERLAND).—Block of shops and houses; R. Carse and Sons, contractors, Oldgate, Morpeth.

Motherwell.—Extensions for Steel Construction Co., Ltd., Whitegates (£1,500); the manager. Large extensions, new Bar Mill, &c., for Clyde Alloy Steel Co. (£100,000); the manager.

Newburn-on-Tyne. — Social club (£2,500); A. E. Appleton, contractor, 154, Verne Road, North Shields.

Newcastle-on-Tyne. — Houses (14), Stokesley Road; A. Potts, contractor, 289, Heaton Road. Flats (26), Silverhill Drive; Northern Housing Development Co., Ltd., builders, Huddleston Road. Garage and workshop, Ponteland Road, for Messrs. McKenzie; Hutchinson and Son, builders, Elswick Road. Extensions to factory, for Scott and Turner, Ltd.; Hetherington and Wilson, architects, County Chambers, Westgate Road. Extensions to foundry for C. A. Parsons and Co., Ltd.; staff architect. Extensions to dry-cleaning factory, Hunters Road, for Presco, Ltd.; G. E. Gibson, architect, 144, New Bridge Street.

Northumberland.—School, Amble, for C.C. (£20,147); J. G. Green and Sons, Ltd., contractors, Warkworth, Northumberland. Schools, Acomb, and Wark; W. W. Tasker, County Hall, Newcastle-on-Tyne.

Nuneaton. — Fire and ambulance station (£20,000), Newtown Road, for T.C.; borough surveyor.

Oldham.—Houses (100), Chadderton, near Oldham; Bury Property Investments, Ltd., 31, King Street West, Manchester. Receiving room, verandah and additional accommodation at the Municipal Hospital (£15,550), for the Health Committee.

Redcar.—Ballroom, Lord Street; Hindmarsh Enterprise, Ltd. Alterations to Sands House, Esplanade; Canon Brunner.

Retford.—Fire station (£8,366), for the T.C.; A. Richmond & Sons, contractors, West Street.

Sheffield.—Houses (21) and garages, Barncliffe Drive; Simpson Bros. (Sheffield), Ltd., Marsh Lane. Houses (22), Woodhouse; J. L. Conway, 340, Abbey Lane. Fourteen flats and garages, Cherrytree Road; J. C. Mason, 55, Norfolk Park Avenue.

Shipley.—Houses (313), Cottingley estate; A. E. Hardy. Extensions to works, Boar Lane; S. Hartley & Co. Extensions to works, Hirst Wood Road; Scott Motor Cycle Co., Ltd.

Shrivenham.—Extensions to Becketts House (£100,000), for War Office; P. D. Hepworth, architect, 7, Gray's Inn Place, London, W.C.1.

Sleaford.—Houses, Providence Square, clearance area; W. Cresswell.

Southampton. — Hangar, Airport (£18,983); borough engineer.

Staines.—Factory, Littleton Lane, Laleham; Spun Concrete, Ltd., 79, Mark Lane, London, E.C.3.

Stockton-on-Tees.—Houses (10), Waltham Avenue; G. Hope, builder, Bishopton Road.

Stourport.—Houses (100), Walshes Farm estate, for U.D.C.; Eadie & Co., contractors, 29, Waterloo Road, Wolverhampton.

Sunderland. — Alterations, to High school; W. and T. R. Milburn, architects, 17, Fawcett Street.

Surrey.—Schools, Dorking (£58,350), Egham (£52,900), Chilworth (£20,987), and Cranleigh (£16,642), for the County E.C. Homes for aged, Guildford (£40,000), Sessions house, Wallington (£28,875) and school, Ash, Guildford, for the C.C.; W. H. Robinson, county architect, County Hall, Kingston-on-Thames.

Wakefield. — Senior school, Saville Street; S. Hutton, architect, Town Hall.

Wallsend-on-Tyne. — Houses, North Road; W. Riddle, architect, 53, Denham Terrace.

Wednesbury.—Houses (130), Park Lane; A. Booth, architect, Town Hall.

Wellington (SOMERSET).—Houses (20), Doctors Meadow, for U.D.C.; S. G. Glass, clerk, Council Offices.

Whetstone.—Drill hall, High Road; Middlesex Territorial Association.

Whitton.—Houses (30), Percy Road; Wates, Ltd.

Worthing.—Houses (21), Clive Drive; Goldsmith & Pennell. Flats (32), Southview Gardens; Williams, Pettett & Gardner. Seven shops and flats, Aldsworth Avenue; West Sussex Development Co., Ltd. Ten shops and flats, Pointers Lane; Liverpool Gardens (Worthing), Ltd. School, Tarring, for the E.C. Reconstruction of Heene baths; borough engineer.

Yorkshire.—Senior school, Beadlam; education architect, Education Offices, County Hall, Northallerton.